MAY 1987
Issue #320

73 Amateur Radio

A WGE Publication

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VHF/UHF

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"IT'S WHAT'S INSIDE THAT COUNTS!"

- **All HF Band Transceiver / General Coverage Receiver**
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Midsize Masterpiece! The deluxe IC-751A includes more high performance features and professional circuitry per cubic inch than any other HF transceiver. Its smooth-as-silk operation and long-term reliability produce the ideal contesting, DX'ing, mobiling and portable rig. Owning an IC-751A truly means "Going First Class!"

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32 Tunable Memories. Store both frequency and mode information. Use them to quick-access your favorite spots or as 32 preferred frequency-remembering VFOs.

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751A187

MODEL 8000 DUPLEX

- Desk top or rack mounted versions
- Pulse or fully regenerated tone dialing
- Full and half duplex operation
- Half duplex privacy mode
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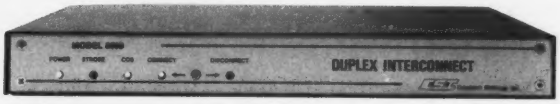
- Auto answer on 1st, 2nd, 4th or 8th incoming ring
- Mobile to mobile signalling
- Telephone initiated control mode
- Dip switch selectable hybrid compensation capacitance.
- Programmable timout and mobile activity timers with unique beeps
- Disconnect beep
- Separate repeat level control
- Lightning protection
- Connectors for options
- 10-16VDC powered

28 dip switches make all features user programmable and selectable.



OPTIONS

8001 ANI code validator (up to 1024 access codes)
8002 1000 call two tone signalling
8003 32 call CTCSS signalling
8004 FCC registered coupler
8005 Centralized computer billing system

NOW ANYONE CAN ENJOY FULL DUPLEX!

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Or, the 8000 can be connected to any repeater for shared use. A landline caller can selectively call any mobile on the system with (end to end) regenerated DTMF (standard), CTCSS (optional) or two tone sequential (optional). Mobiles can even selectively call **each other!**

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A high performance VOX based patch for simplex systems and for operation through remotely located repeaters.

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Attractively styled to complement any decor.

STANDARD FEATURES (Both models)

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- Digital "fast VOX"
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- Secret toll disable code
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- Automatic busy signal disconnect
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- Three digit access code (eg. ✱ 73)
- Ringout (reverse patch)
- Ringout inhibit if channel is in use
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- Spare relay position
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- And much more

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IC-751A

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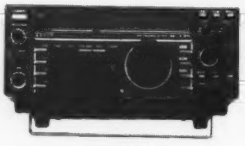
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TR-3600A

TR-751A

TM-2530A
TM-2550A
TM-3530A

TH-21AT
TH-31AT
TH-41AT

TS-940S

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New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for $169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
$169.95

MFJ-1270
$139.95

Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible $169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

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All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and terminal program.

If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . .everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port with an apropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them.

Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

You get an easy-to-read manual, a cable to connect your transceiver (you have to add a connector for your particular radio), a connector for the TTL serial port and a power supply for 110 VAC operation (you can use 12 VDC for portable, remote or mobile operation).

Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.

MFJ-1273, $49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast! This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

24

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NEVER SAY DIE

NOVICE ENHANCEMENT—WELL, IT WON'T HURT

The Novice Enhancement bands will, in my estimation, help to attract a few more Novices and should help considerably to improve the percentage of Novices who upgrade.

The Novice ticket was always a kick in the head—forcing newcomers to use our slowest and most difficult means of communications on our most crowded and difficult bands. One could hardly orchestrate a better system to defeat Novices if one tried.

But of course what will probably happen is the same as we had thirty years ago when Novices were permitted to use phone from 146–147 MHz—they'll rush to use the phone allocations, and that's all most of 'em will ever use. The two-meter Novice phone allocation was removed when it was found that a very high percentage of Novices used it exclusively and then, when their nonrenewable licenses ran out, were gone—forever.

Look, I've been pushing for a no-code license (with a more serious technical exam in its stead) for over thirty years now, but I've never suggested this was any kind of a cure-all for our dropping numbers. A no-code ticket, plus the new Novice bands, will help. I'll expect to see a small growth in our numbers, but as far as having even a slight effect on America's loss of high-tech career people. . . no way.

If we're going to get back to even the moderate growth amateur radio had from 1946–1963 (17 years) of 11% per year, we're going to have to get serious about rebuilding the infrastructure which brought us young newcomers—school radio clubs. Today, even after editorials and articles in both *73* and *QST* on the importance of getting youngsters into the hobby, many (perhaps most) ham clubs are still hostile to kids and go out of their way to discourage 'em. I'm not just blowing steam—I'm getting letters from young hams reporting their great frustration over the treatment they've gotten from their local ham clubs.

How is it at your club? When a Novice comes to a meeting, how many members go out of their way to welcome him to our hobby? How many invite him to visit their ham shack? How many offer to help him upgrade? How many even say hello? What I keep hearing is that the club members treat Novices like Untouchables in India. Yuccck, a Novice—what's *he* doing here?

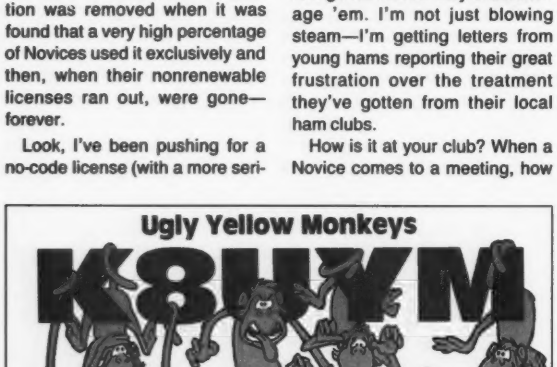
Probably the brightest side of Novice Enhancement is that the ham industry will start seeing some additional equipment sales—which I don't begrudge them a bit.

By now you've heard that the FCC is well on its way toward taking almost half of our 220-MHz band away so more ordinary people can have mobile radios. After how many years of my warning you this was coming, it shouldn't be even a small surprise. And don't buy the guilt trip about your not using the band. The reason most of us haven't used 220 MHz is because we didn't need to and there weren't any big benefits to using it—so why should we spend several hundred hard-earned dollars to buy the gear? The hard fact of life is that with the small number of active hams we have left today, much of two meters is little used over most of the country.

Hey, it wasn't all that long ago that the top two MHz of two meters was virtually unused. Hams with longer memories will remember when the publisher of *CQ* proposed giving the two MHz up so it could be a new CB band and thus get away from the horrid skip plaguing eleven meters. We've solved that instead by getting rid of the sunspots—at least for a few years.

Last year there was Don Stoner's proposal to take the top two MHz of six meters and turn it into a Citizen's Packet Band. I think this was more defeated by

Continued on page 10



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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Read This Now: As you read this, you will find your eyes becoming heavy—heavy—heavy—you can hardly keep them open. You are oh so sleepy, but you can't stop reading this fine print. Though you will have no recollection whatever of reading this when you awake, you will find yourself inexorably drawn to Las Vegas in November for the Ham/West hamfest. You won't feel really whole again until you have come to the *73* booth and signed a renewal of your *73* subscription—even if it hasn't run out yet. Right after you read this, you will be wide awake—you will feel wonderfully refreshed and turn immediately to read Wayne's editorial—you will have no memory whatever of reading this—and you will start making vacation plans for Ham/West tomorrow. Now wake up!

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pacesetter in Amateur radio

YES! 220 MHz

220: Kenwood Style!

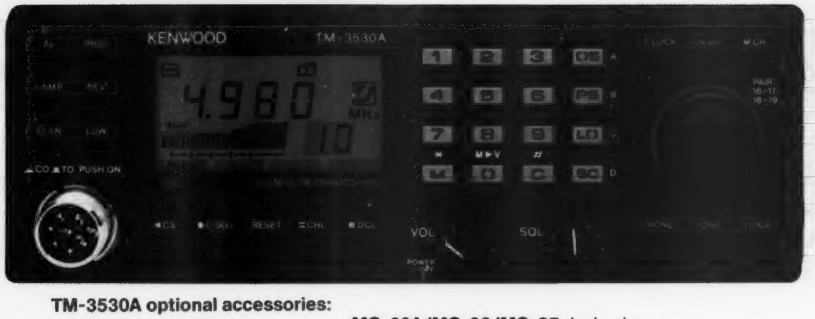
TM-3530A

The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- High performance GaAs FET front end receiver

- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector—relieves stress on microphone cord
- HI/LOW power switch (adjustable LOW power)



TM-3530A optional accessories:

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48B** extra DTMF mic. with UP/DOWN switch
- **MC-43S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50B** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100B** compact SWR/power meter

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

TH-31BT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- BT Series has built-in tone
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case

TH-31BT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook

TH-31BT with DTMF pad shown. Optional RA-9A attached.

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40, 15, 10, and 6-meter all mode "Quad Bander"

- Keyboard selection of frequency, as well as "traditional" VFO
- 80 memory channels store frequency, band, mode data
- All-mode squelch, noise blanker, RF attenuator
- Optional general coverage unit, voice synthesizer, FM unit, IF filters

TR-50

1.2 GHz FM transceiver

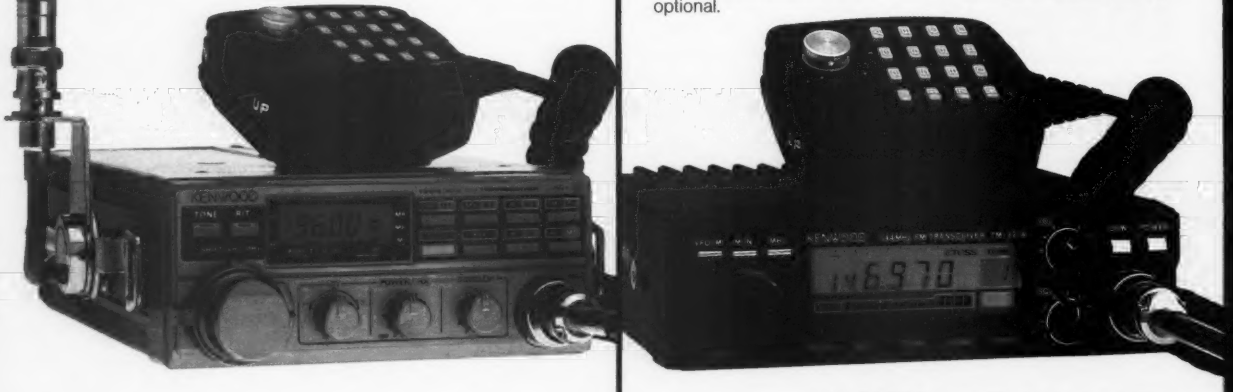
The perfect portable for microwave mountain-topping!

- 1 watt output
- LCD frequency readout with S & RF power meter
- 5 memory channels
- Odd split on memory channel 5
- Includes: Battery set, charger, external power cable, 16-key DTMF hand microphone, sleeve antenna with adjustable mount, shoulder strap.

TM-221A/421A

The compact FM mobile transceivers

- TM-221A: 2 m, 45 W, with expanded receiver coverage (138-174 MHz). Modifiable for MARS or CAP operation. (MARS or CAP permit required.)
- TM-421A: 70 cm, 35 W. The first compact 35 watt 70 cm transceiver!
- Built-in front panel-selectable CTCSS encoder. Decode optional.
- Famous high performance Kenwood GaAs FET front end.
- 14 full-function memory channels, 2 channels for odd split operation.
- 16-key DTMF mic., mic. hook, mounting bracket, and DC cable included.
- Remote control telephone- style handset option (model RC-10).



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A complete line of accessories is available for these transceivers.
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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

QRX . . .

EDITED BY PERRY DONHAM KW1O

Golden Gigahertz Contest

ICOM AMERICA AND *73* are proud to announce that the first **Golden Gigahertz Contest** will be held from **0001 UTC July 13th through 2400 UTC July 14th.** The contest frequencies are 1.260–1.300 GHz. All participants will receive a T-shirt and a hat, courtesy of ICOM. A "Golden Gigahertz" mounted on a plaque will be presented to the winner. **Next month** in *73* we'll print the complete rules and there'll be a coupon for you to send in to receive your log sheets and your T-shirt/hat. In the meantime, get on 1.2 gigs.

Sour Sale

IN A SOUR GRAPES move that probably had Novices laughing their heads off, hams at the recent Wheaton (Illinois) Hamfest displayed their anger over Novice Enhancement by selling off their 220-MHz gear at giveaway prices, saying that they would never again operate on that band, or any other band where Novices were allowed to use a microphone. Of course, savvy Novices were stumbling over each other trying to get in line to buy the cheap equipment. For the most part, sentiment seems to be running in favor of the expanded privileges, although some diehard (i.e., narrow-minded) hams are dead set against the idea. These nonprogressives will be turning their collective backs on our most precious resource: the horde of bright-eyed, eager-to-learn amateurs that are the lifeblood our hobby so badly needs. We all should make a special effort to encourage the Novices we come in contact with to explore the new range of possibilities now available to them.

Range Wars II

IT'S AMAZING TO ME that this hobby can be deregulating with one hand and getting crazily more complicated with the other. One of the biggest complications is the problem of coordinated repeaters, which looms larger and larger each month. The fact of the situation is that there are just too many repeaters on the air: One estimate (I think it was Wayne's) projects that we are rapidly approaching the one-ham, one-repeater mark. (One fine result of this boom is that, while there are more machines to work through, the limited number of hams using repeaters is spread out over the increased number of repeaters. We end up calling fruitlessly on machine after machine in search of a QSO.) Folks are getting nasty about who has the "right" to occupy a certain frequency, so much so that the FCC had to step in recently and declare that non-coordinated repeaters found interfering with coordinated repeaters were at fault and had the burden of resolving the problem. This, of course, started another equally intense battle over who is a "*bona-fide*" frequency coordinator, with little repeater kingdoms sprouting up all over the place. The upshot of this story is that the ARRL will now publish in the *ARRL Repeater Directory* only those listings that have been submitted by a *bona-fide* Frequency Coordinator. If you have no idea whether or not your repeater (you do own one, don't you?) is coordinated or not, look in the *Directory* for the coordinator in your area and ask him; you can also get the list of "approved" coordinators by sending an SASE to the League at 225 Main Street, Newington CT 06111, Attention: Repeater Directory Editor.

Buy DXCC

IF YOU'RE A HAM who prides himself on owning the latest thing in amateur radio, the kind who immediately sells his transceiver when the new models are announced, then have we got a deal for you! For a mere $10 million or so, you can own your very own DXCC country! That's right, you get an entire atoll (Palmyra) complete with its very own callsign (KH5). Of course, since you'll own the country, you can change the callsign to fit whatever mood you're in. **Jack Wheeler KH6CC,** speaking in the *W5YI Report*, advises, "The weather on Palmyra is terrible . . . it rains all of the time. The clothing will rot right off your back! It's not a desirable location for a permanent installation. That's why the Navy gave it up so readily after the war." If you are interested, contact Savio Realty in Honolulu.

King Unpinned

ROBERT KING WB8WKA has signed a consent agreement which ends a battle with the FCC that has lasted nearly two years. The trouble stemmed from a complaint that King allegedly maliciously interfered with the .04/.64 repeater in Detroit. After being indicted with the charges, King agreed to a 14-day suspension of his commercial radiotelephone license, while denying the charges of interference. The commission then revoked his amateur license based on King's agreement to the 14-day suspension. The revocation was overturned by an FCC Administrative Law Judge who found that "the bureau carefully concealed from Mr. King and his counsel its intention to use Mr. King's consent to the suspension of his commercial radio license as a basis for seeking revocation of his amateur radio license." The consent agreement means that the FCC has terminated revocation and suspension proceedings against King; the agreement is not an admission of guilt.

Jammer Jammed

LARRY KACZMARCZYK, ex W3UQW, of Manhonoy City, Pennsylvania, was recently fined $1,000 for malicious jamming which was monitored *and* visually observed by engineers from the Langhorne FCC office. Kaczmarczyk had surrendered his license for cancellation some time ago as a result of an FCC case against him involving alleged malicious interference.

No 17 Now

THE FCC HAS DISMISSED a petition filed by the ARRL which sought earlier access to the new 17-meter band (18.068–18.168 MHz). Over 60 countries now allow amateur operation in the segment, but the current primary users (government agencies) say that they will need the band until July 1, 1989.

5L Fete

1987 IS THE 25TH anniversary of the Liberia Radio Amateur Association (LRAA), and the group has planned several events to commemorate the occasion. Throughout 1987, Liberian hams will use a 5L prefix in place of the normal EL (EL2XT becomes 5L2XT, etc.). During special 25th-anniversary events, the suffix /25 will be tacked on. The Liberian Ministry of Post and Telecommunications is issuing a special postage stamp in honor of the event. Other activities include an International QRP Day, a special DX contest on Liberian Independence Day (July 26), and an emphasis on the Work All Liberia award. To qualify for the award, work one station in each of the nine Liberian counties (the number in the call denotes the county) on at least three bands. Send QSLs confirming your contacts and U.S. $5 to LRAA, PO Box 987, Monrovia, Liberia.

Dateline Dayton

THE DAYTON AMATEUR RADIO ASSOCIATION (DARA) is once again offering their popular college scholarship program. Any licensed amateur graduating from high school in 1987 is eligible to apply for one of the $1,000 awards. The scholarships are granted based on a combination of financial need and academic accomplishment, with consideration given to service to amateur radio and community involvement. Applicants are not restricted to those pursuing a baccalaureate degree; those working toward associate or trade/vocational degrees are also encouraged to apply. **All entries must be postmarked no later than May 15, 1987.** Winners will be announced around June 1, 1987. For more infor-

mation and an application form, write to the DARA Scholarship Committee, 317 Ernst Avenue, Dayton OH 45405.

More Money

THE FOUNDATION FOR AMATEUR RADIO (FAR) has announced that twenty-six scholarships will be awarded for the 1987–88 academic year. Any licensed amateur pursuing full-time studies at an accredited college, university, or technical school is eligible to compete for these awards. Most of the scholarships require at least a General-class license. The awards range from $350 to $900, with preference given in some cases to specific geographical areas. Information and application forms are available from FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740.

Bed Pan Portable

MEMBERS OF THE RADIO AMATEURS OF EASTERN LONG ISLAND were recently asked to provide backup communications for Long Island's Southampton Hospital while the facility's telephone system was being expanded. Organizers Bill Yamka N2DXG and Charlie Styler WA2UEG were joined by Richie Sellentin N2RL, Susie Yamke N2GYR, Mary Sellentin N2GTK, Rune Pehrson W2VMI, Rod Swiderski NU2M, and Serge Popper N2DEJ; the group was spread out to strategic locations throughout the hospital and communicated via two meters.

F8E OK

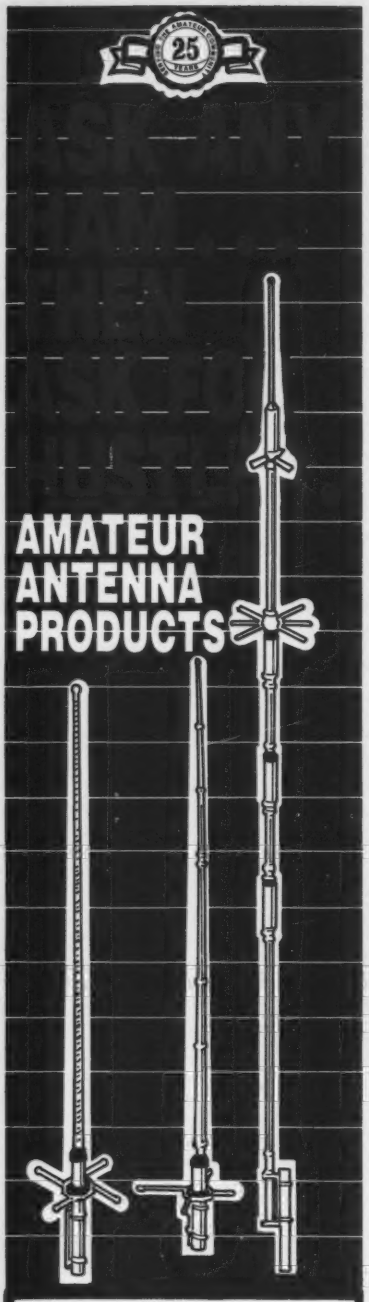
HAMS MAY NOW USE F8E on 902 MHz and above. F8E, in which the carrier is modulated by two or more voice channels (stereo), was previously restricted to only the 900-MHz band. The action is in response to a petition submitted by the Southern California Repeater and Remote Base Association.

Israeli Shift

NEW ISRAELI PREFIXES will be showing up on the bands very soon, according to a story in *The Westlink Report*. Israel's calls have been restructured, with the callsign now reflecting the operator's license class. Novices will hold calls from the 4Z9AAA–4Z9ZZZ block; class B ops will retain their 4X4, 4Z4, and 4X6 calls; class A (up to 1,500 Watts out) amateurs will sport new 4X1 prefixes.

Exit, SL

THIS MONTH'S NEWS came to you with help from *The W5YI Report*, *Westlink*, and *The ARRL Letter*. Please send your news notes and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attention: QRX.



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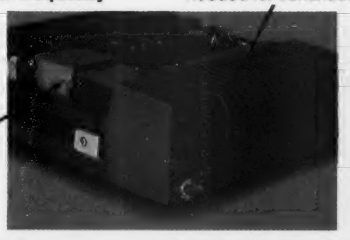

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NEVER SAY DIE

from page 4

worries over interference to TV than any concern over the loss to amateur radio. The scuttling of the FCC's try at a no-code ticket for us left us with few friends where they really count, so we'd better get used to giving up our bands—particularly in the microwaves.

The only way I can see a major change coming about would be if we stopped our infighting and our pretending that our days of fun and games will never end. It is time to get serious about getting our hobby growing again. And I mean growing at 30–50% a year, not 5%.

Westlink reported that some hams, upon learning that Novices would soon be sharing 220 MHz with them, sold their rigs in disgust. Frankly, I think they did exactly right. The last thing we need on 220 MHz to greet the Novices are a bunch of narrow-minded bigoted rednecks like that. No, what we do need up there is a big welcoming committee, complete with repeaters. More than that, let's start setting up 220 repeaters which crossband to 20m and 75m, so they can discover the fun we've been having.

How many crossband contacts have you ever made? I've had a ball with 'em down through the years. Back in 1950, I used to interconnect 2m and 80m RTTY stations. Back in the early repeater days, the Concord (NH) repeater would switch over to 6m for a few minutes every hour. If you started using it during that time, it would stay in that mode until you quit, so I had lots of great 2/6m contacts.

Along in 1971, my WR1AAB repeater was set up so it could work 2/6m or 2/10m. I had a ball talking with South American stations through my repeater. I set up another for 2/20m and was able to walk almost anywhere in town and work 20m with my hand-held 2m rig.

Back in 1946, I had a ball interconnecting 20m and 75m stations, making it possible for those on a 75m net to work some darned good DX. That was quite legal and, by the way—still is. It was a ball getting a ZS or a 5N into a 75 round table. I'll never forget it.

We can do the same for Novices if we set up our repeaters so they can provide a window on our lower bands. The FCC has gotten used to this and agrees it's legal.

It's a shame that we're about to lose a big chunk of 220, now that we may have the first real use for the band. The problem, as I mentioned earlier, is that we have far too few amateurs to actually use the frequencies we've been allotted. We tend to take the easy path, jamming ourselves up on the low bands and avoiding the extra expense and trouble of developing the UHFs.

When repeaters got going on 2m, most 6m operation soon ceased. Much of 6m is deserted now. Oh, if the sunspots bring some skip back to 6m, we'll see some action, but since there are very few countries where amateur operation is permitted on this band, it won't be big.

Two meters is fairly well occupied, between sideband and repeaters. 220 is sparsely used—a few repeaters, but most of them not very active. Heck, for that matter, I'd estimate that about 75% of the 2m repeaters are rarely used. These are more monuments to egos than real services to their communities.

"The last thing we need on 220 MHz to greet the Novices are a bunch of narrow-minded bigoted rednecks. What we do need up there is a big welcoming committee, complete with repeaters."

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On 450, there are a few repeaters and a lot of control links—most of 'em in the major urban centers. Above that is almost nothing, being practical about it.

I believe we'd have to double the number of active hams before we'd see much action above 450 MHz—or even a reusing of 6m. Hey, back when 2-1/2m and 10m were all we had, back in early 1946, 10m was a lot more active than it is today—even at night.

So don't let anyone build up a guilt trip for you because you haven't spent time and money to get on 220 MHz—or 1296 MHz, etc. It isn't your fault—or mine—that we don't have enough hams to even begin to use the bands allocated to us. How long did you think the manufacturers were going to let all those incredibly valuable and virtually unused frequencies sit there gathering dust?

It was back around 1971 when a CB manufacturer bragged to me that 220 MHz would shortly be a new CB band. He claimed the EIA had "bought" the chairman of the FCC. It did look as if we were going to lose it, but we got a new FCC chairman and that eased the pressure.

Just where lobbying and "buying" leave off, I don't know. I do know this manufacturer was willing to cover any bet I cared to make—they'd already brought out a 220-MHz rig for the new service. He said that he and another manufacturer were in cahoots on the project and it was an accomplished fact. His partner was very arrogant about it at the time—wonder how he's doing today. The CB crash demolished them—which seemed like poetic justice, since they were prime movers in the 50-channel CB move, as I recall. And that's what killed CB—or at least badly wounded it.

What can you do? Not much about the 220 loss, but you can start working toward getting amateur radio growing again. You can welcome Novices to what's left of 220. You can set up crossband repeaters for them. You can work toward getting school radio clubs going again so we'll have more youngsters coming into our hobby. Or you can shrug your shoulders and carry on, bitching, but doing nothing.

If you disagree, what do you think. . . and why do you think it? Any facts?

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3) First-class hotels all the way.

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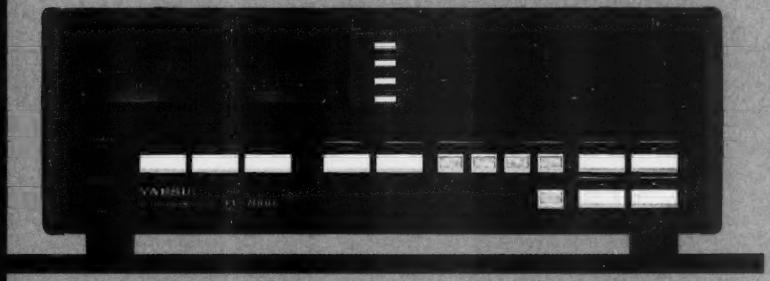
5) Ahhh, the shopping! Few return without a custom-made suit or two. Do you want your new custom raincoat to be Burburry or London Fog design? What monogram do you want on your $10 custom-made shirts? Better bring an extra bag—I always do. $3 Gore-Tex skiing gloves and Member's Only jackets for $5 at Itewon in Seoul. Bargain furs. CDs from all over the world—oodles of

Continued on page 42



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LETTERS

WHY WE MUST FIGHT TO SAVE 220

While many of you might find it hard to believe, fighting to save the 220–222-MHz portion of 1-1/4 meters is more than keeping 2 MHz of spectrum for our service. What we have here is really an all or nothing situation. Here's why.

For more years than I can remember, I have been trying to get it into the sometimes thick skulls of American radio amateurs that every kilohertz of spectrum that we have is worth millions of dollars to companies who can use it to provide other services.

For instance, let's take the 420–450-MHz amateur band. 30 prime MHz of spectrum right where the vast majority of UHF land-mobile radios now operate. Think if you will for a moment in terms of simple economics. The basic top-line land-mobile radio sells for about $3,500 these days. My friends tell me that it's about the same for a base. An average business will probably have at least a half-dozen mobiles and one or two base radios. Then there's installation of antennas and other peripheral gear.

Next comes the standard shared community repeater, which can cost another several grand. It has to have an antenna and a duplexer, and it pays a site rental fee. Some sites are charging systems $300–$600 a month or more. There's also the monthly fee to use the radio relay system, and in many places that's based on whatever the traffic will bear.

Multiply that out by the number of repeaters and users that can be crammed into 30 additional MHz of space, and you are talking annual profits into the megabuck range. So, if you are a businessman involved in two-way land-mobile, wouldn't you be looking at your neighbor with a jaundiced eye? Nor is land-mobile the only user up there.

I'm a broadcaster by profession, and we use frequencies in and around the 460-MHz region for remote pick-up. And, there are hundreds if not thousands of other potential users out there as well. So, what is 420 to 450 MHz worth to anyone who can wrestle it away from hams? You may find this hard to believe, but over a 10-year span at maximum utilization, the figures would be into the hundreds of millions of dollars. And, many of us freely admit that in many parts of the nation, 420–450 MHz is an underutilized band!

I can hear you saying: "Well, at least two meters is safe. Heck, there must be a half-million hams on those 10,000 repeaters." I can only remind you that even if every licensed ham were active on 2-meter FM—and they're not—it would be nothing compared to the amount of people that land-mobile (or any other service eyeing our bands) might squeeze into that same 4 MHz at several grand a pop.

What I've said about 420–450 applies to the 2-meter band and any other—including the HF bands. As this is being written, word is quietly filtering out from an HF WARC that many Third World nations want hams kicked off some prime high frequency bands to make way for more international shortwave. If I may quote from the January 15 issue of the *W5YI Report*:

"...many countries have submitted more requirements than can be handled in the presently allocated frequency bands. At this point it looks impossible that these needs can be filled by the ITU. There has been some formal discussion about developing and adopting a resolution at this conference that would call for a future conference to completely reallocate the high frequency bands.... A highly placed government official (who asked that he not be named) recently told me that the HF broadcasters would be looking for more spectrum since they do not have enough now and 'The amateur bands would be extremely vulnerable at a future allocations conference.'"

Most high-frequency ham bands are likely to come under attack because they directly adjoin spectrum used by HF broadcasters. The two primary targets are likely to be 40 and 20 meters! The new 10-MHz band might be targeted as well. And here it's not just gigabucks at stake, it's nationalistic pride as well.

So why fight to save two lousy MHz of a band that you yourself don't use and may never use? Simple. If we lose 220–222 MHz, it will prove that we are vulnerable—that we cannot wage a successful campaign to protect our spectrum. Once "they" know this, no amateur band from dc to light will be safe from the money-mongering spectrum thieves. The "they" are all other services, service users, and allied businesses that would profit immeasurably from the demise of amateur radio.

If we ever let this "Pandora's Box" be opened, it won't be a "hunt and peck" for a few kHz here and a few kHz there. The enemy will make one swift frontal attack, and it will be all over. In a flash, amateur radio will cease to exist! Think I'm crazy? Blowing straws in the wind? For your sake, I hope so. But, as even Wayne will tell you, in the 25 years I've been writing for *73*, I have been correct far more times than I have been wrong. I did call it wrong on no-code, but nobody's perfect.

Some of you reading the proposal might be tempted to support 87-14 because it holds the promise of three secure MHz of spectrum if we give up two MHz under the current insecure allocation plan. I say "nuts" to this proposition. What we want, what we demand, the only thing that we hams will settle for is 220–225 MHz being made amateur-exclusive, and all others be damned!

Although the deadline for comments will have passed by the time you read this (unless an extension is obtained), there is still one thing that you can do. If you have a couple of extra QSL cards handy, take a few of them and send them to your congressmen. Where you would normally put a signal report, write instead "The FCC's Office of Engineering and Technology is trying to steal our ham bands with Docket 87-14. Right now they want our 220 band. HELL NO—I WON'T GO!"

Former California Congressman James Corman said back in 1979 that nothing gets the attention of a legislator like a QSL card. We know for a fact that this method is effective in dealing with jammers and foulmouths. I wonder what impact several hundred thousand QSL cards reaching Congress might have on the future existence of the Office of Engineering and Technology? Remember, turn-about is fair play.

Bill Pasternak WA6ITF
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Editorial Offices
WGE Center
Peterborough, NH 03458-1194
603-525-4201

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Spectrum Repeater/Link

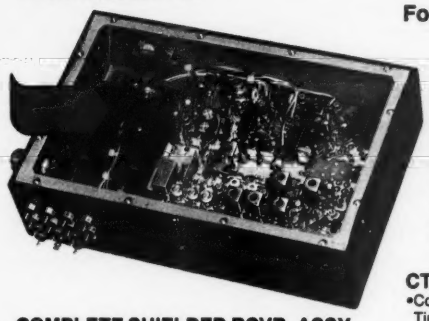
High Performance Boards & Sub-Assemblies

These are professional "Commercial Grade" Units—Designed for Extreme Environments (−30 to 60° C.) All Equipment Assembled & Tested.

For 10M, 2M, 220 MHz, & 440 MHz

New FL-4 UHF Helical Resonators

Installed in Receiver or FL-4H Preselector Unit



COMPLETE SHIELDED RCVR. ASSY.

VHF & UHF Receiver Boards

SCR200A-VHF SCR450A-UHF

- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—Reduces Overload, Spurious Resp. & Intermod.
- Sens. 0.25 µV/12dB SINAD typ.
- Sel. -6dB @ ± 6.5 KHz. -130dB @ ±30KHz. (8 Pole Crystal + 4 Pole Ceramic Fltrs.
- 'S Meter', Discriminator & Deviation Mtr. Outputs!
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. (*"Super Sharp" IF Fltr. also avail.*)
- ***New! 30 KHz B.W. IF Filter for High Speed Packet.***

Complete Receiver Assemblies

- Rcvr. Board mounted in shielded housing.
- Completely assembled & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000/2000X. Ready to drop into your system!
- UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!

FL-4H

Receiver Front-End Preselectors

- **FL-6: 6Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz)**
- **FL-4H: 4Hi Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
- Extremely helpful at sites with many nearby transmitters to "filter-out" these out-of-band signals.

Call or Write for Data Sheets

ID250A CW ID & Audio Mixer Board

- **Improved! Now includes "audio mute" circuit and "Emergency Power ID" option.**
- 4 input AF Mixer & Local Mic. amp.
- PROM Memory—250 bits/channel.
- Up to 4 different ID channels!
- Many other features. Factory programmed.

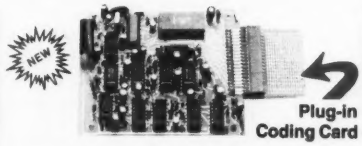
CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR,"Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

Power Supply Boards

NEW

- **SCP12** 12VDC @ 0.3A out.
- **SCP512** 12 VDC @ 1A & 5VDC @ 0.4A out. (1.1A total max. out.)
- **SCP512A** As above, but also w/ −12VDC @ 0.1A

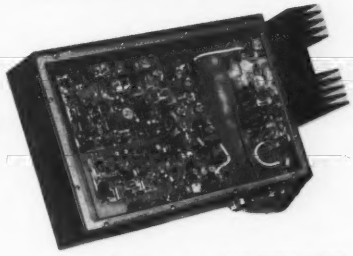


TTC300 TOUCH TONE CONTROLLER

- High performance, Super versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
- Uses new high quality Xtal Controlled Decoder IC, w/high immunity to falsing
- Decodes all 16 digits
- 3 ON/OFF Functions per Main Card. Easily expandable to any no. of functions w/Expansion Cards.
- Codes quickly field programmable via plug-in Coding Cards. Many unique 3-digit codes available. Not basically 1-digit as with competitive units.
- Latched or pulsed outputs.
- Transistor Switch outputs can directly trigger solid state circuitry or relays, etc. for any type of control function.
- Low Power Consumption CMOS Technology. 5VDC Input. Gold-plated connectors.

SCP30 HEAVY DUTY 30 AMP RACK MT. POWER SUPPLY

- 13.8 VDC out. 115/230 in, 50/60 Hz.
- 30A @ 70% duty, 25A @ 100% duty.
- Massive 30 lb. Transformer & Heat Sinks.



Improved SCT410B Transmitter Assy.

SCT110 VHF Xmtr/Exciter Board

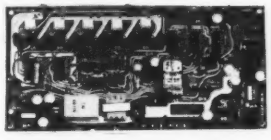
- **10 Wts. Output. 100% Duty Cycle!**
- Withstands High VS WR
- True FM for exc. audio quality
- Designed specificially for continuous rptr. service. Very low in "white noise."
- Spurious − 75 dB. Harmonics − 60 dB.
- With .0005% precision grade xtal.
- **BA-30 30 Wt. Amp board & Heat sink,** 3 sec. L.P. filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available**

SCT110 Transmitter Assembly

- ***SCT110 mounted in shielded housing***
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Now includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. UHF AMP. BD. & HEAT SINK**



SCAP Autopatch Board

- Provides all basic autopatch functions
- Secure 3 Digit Access; 1 Aux On-Off function, Audio AGC; Built-in timers; etc. Beautiful Audio!
- 0/1 inhibit bd. also available
- Write/call for details and a data sheet

RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land-line "answering" circuitry

Lightning Arrester For Autopatch

- Gas Discharge Tube shunts phone line surges to ground
- Handles up to 40,000 Amps!
- The Best device available to protect Autopatch equipment from lightning damage. $17.00 + S/H.

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"When You Buy, Say 73"

NEW PRODUCTS

EPI's model RFA-16B VHF/UHF rf amplifier.

EPI RF AMPS

Electron Processing, Inc., has introduced a line of Signal Intensifier™ rf amplifier modules suitable for almost all receiving applications. Available in either MF/HF or VHF/UHF versions, they feature 13 dB gain with very low noise figure (typically under 5 dB). Model RFA-20 (MF/HF) comes with a pair of SO-239 female coaxial connectors. Model RFA-16B is equipped with your choice of "F" connectors or "Motorola" connectors. Other connector styles are available upon request. Both feature a built-in 117-V-ac power supply. Prices start at $29.95.

For more information on EPI products, circle number 205 on your Reader Service card.

DASH-MOUNTED CTCSS ENCODERS

Selectone Corporation has announced a new line of CTCSS dash-mounted Mobilecall® encoders that are used for selecting one of several repeaters operating on the same frequency. Up to ten different frequencies can be selected with a backlit pushwheel switch on the front panel. Tones are digitally programmable to any of the 38 CTCSS frequencies.

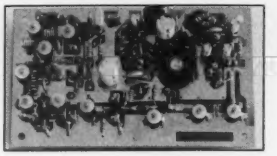
The units operate on 13.6 V dc (±20%) at less than 25 mA. Tone output level is adjustable to 1.5 V rms. The user has a choice of a 6-dB-per-octave roll-off or flat audio output. Built-in light sensors automatically illuminate the switch at night.

These Mobilecall encoders are available in two configurations: The ST-109A ($99) is the standard unit, and the ST-109B ($129) adds a phase-shift circuit for squelch tail elimination (STE) which is compatible with most Motorola and GE CTCSS systems, including reed-type decoders. The units come complete with mounting bracket and cable assembly.

For more information on these Selectone encoders, circle number 213 on your Reader Service card.

33-CM ATV EXCITER/MODULATOR

P.C. Electronics has introduced its model TXA5-33 1-Watt ATV exciter/modulator board for the 33-cm band. Most activity has been on the 70-cm band until now. By also having a 33-cm ATV station, hams can run full-duplex video and audio crossband with another station on 70 cm. This board should make it easy to put up a short-distance video link, crossband ATV repeater, bulletin board video repeater, or public-service/weather-radar video service—without tying up one or both of the usual 70-cm ATV channels. The TXA5-33 sells for $139.



The TXA5-33 exciter/modulator board for the 33-cm ATV band.

For more information about the TXA5-33 and other P.C. Electronics products, circle number 209 on your Reader Service card.

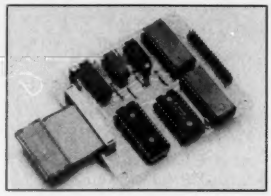
PC WEATHER

Technology Marketing, Inc., has introduced a sophisticated weather monitoring and analysis system called PC Weather. PC Weather comes complete with its own anemometer/wind-vane assembly, two temperature probes, a half-slot PC board, and display software. This system allows you to monitor and display local weather conditions on an IBM PC/XT/AT or compatible. Features include wind speed, wind direction, barometric pressure, inside and outside temperatures, and windchill factor.

The PC Weather display is background resident and may be accessed at any time, even from within a spreadsheet or word processor. An on-board alarm will be sounded when certain programmable weather conditions are met. PC Weather is externally powered by an ac adapter and continues to monitor weather conditions and alarms even when the host computer is turned off.

The PC Weather package is priced at $349.95. Options include a rain gauge and PC Weather Pro, an enhanced software package that provides expanded display data and analysis capabilities. Each of these options is priced at $69.95.

If you really want to let someone have it when they ask how the weather is, circle number 211 on your Reader Service card.



Communications Specialists' TP-TOS tone output switch module.

CSI TONE OUTPUT SWITCH MODULE

Communications Specialists, Inc., is now offering the TP-TOS tone output switch module as an add-on accessory for their TP-38 shared repeater tone panel. The TP-TOS provides individual discrete switch outputs for the standard 32 tone frequencies from 67.0 to 203.5 Hz. The 32 outputs can be configured to provide either a pull to logic ground, a pull to logic high, or to route an audio signal to another transmitter, receiver, tape recorder, etc. The TP-TOS is priced at $99.95.

For more information about the Communications Specialists TP-TOS, circle number 212 on your Reader Service card.

MFJ-1274 HF/VHF PACKET TNC

MFJ Enterprises, Inc., has released its latest TAPR TNC-2 clone, the MFJ-1274. The 1274 works on VHF, HF, OSCAR, and other non-FM packet. MFJ has made the TAPR modem selectable for VHF and HF operation and has added: a 20-segment LED tuning indicator, a TTL serial port, a lithium-battery memory backup, and a new cabinet. The 1274 interfaces with any computer with an RS-232 serial port and appropriate terminal program.

The 1274 features AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true data

Selectone's Mobilecall CTCSS encoder.

The MFJ-1274 HF/VHF packet TNC.

carrier detect for HF, multiple connects, and 256K EPROM/16K RAM. Speeds in excess of 56K baud are possible with a suitable external modem. The 1274 sells for $169.95.

For more information about the MFJ-1274 TNC, circle number 208 on your Reader Service card.

WORLD HAM NET DIRECTORY

The World Ham Net Directory by Mike Witowski has been published by Tiare Publications. It lists 300 special-interest ham radio networks by name, operating frequency, and day/time. The nets cover a wide range of interests including emergency communications, DXing, missionary work, foreign service, retirees, airline employees, weather watchers, traffic handling, and more. This book provides amateurs with the chance for new contacts and SWLs with more opportunities for interesting listening. *The World Ham Net Directory* is priced at $9.95 plus $1 shipping and handling.

For more information about *The World Ham Net Directory*, circle number 214 on your Reader Service card.

KANTRONICS KPC-4 DUAL-PORT COMMUNICATOR

The KPC-4 Dual-Port Communicator is Kantronics' newest packet unit. It features two fully functional VHF packet ports, digipeating on each port, VHF gateway between ports, and an RS-232 computer port. Digipeating and gateway operations occur simultaneously while you're connected on one or both ports. The RS-232/TTL terminal interfacing provides compatibility to all computers. Stream switching provides for access to both radio ports, each of which supports AX.25 protocol.

The KPC-4 also contains the Personal Packet Mailbox™ feature, which allows you to leave and retrieve messages. The KPC-4 is priced at $329.

For more information about the KPC-4, circle number 204 on your Reader Service card.

HAMTRONICS WXSAT CONVERTER

Hamtronics™, Inc., has introduced the CA137-28 receiver converter for reception of weatherfax pictures from satellites transmitting in the 137-MHz band. The CA137-28 translates all signals received in the 136–138-MHz satellite band for reception on tunable 28–30-MHz wideband FM receivers. To make the conversion in dial frequency, subtract 108.000 from the frequency you want to receive. The receiver uses a low-noise front end to provide sensitivity of less than 0.2 uV. It operates on 13.6 V dc at 30 mA. The CA137-28 is available for: $69 wired and tested in a cabinet; $49 in kit form; and $39 for a kit to build just the PC module. Shipping and handling is extra.

For more information about the CA137-28 converter, circle number 210 on your Reader Service card.

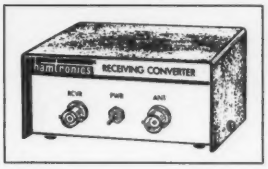
SEBHC JOURNAL

The *Society of Eight-Bit Heath Computerists Journal* is a monthly newsletter dedicated to serving the owners of Heath/Zenith H-8 and H/Z-89/90 computers. Its objective is to keep these computers alive, well, and productive, and to prevent the average H/Z eight-bit machine user from foundering in the sea of "Big Blue" clones. A one-year subscription is $15.

For more information about the *SEBHC Journal*, please circle number 217 on your Reader Service card.

TOKYO HY-POWER LABS 160-W 2-METER AMP

Tokyo Hy-Power Labs, a subsidiary of Encomm, Inc., has released their model HL-160V25A 2-meter amplifier. This amplifer provides 160 Watts of output from 25 Watts of input across the entire 2-meter band. The HL-160V25A amp can be used for FM, SSB, and CW operation and includes an internal GaAsFET preamp. The HL-160V25A is priced at $269.95.



Hamtronics' CA137-28 weather satellite converter.

For more information about Tokyo Hy-Power Labs amplifiers, circle number 215 on your Reader Service card.

DSE FIELD STRENGTH METER KIT

Dick Smith Electronics, Inc., has announced a new field strength meter kit. The field strength meter is built on a small PCB that mounts directly on the meter terminals. Only the sensitivity pot and power switch are offboard. The telescopic antenna mounts via a small right-angle bracket which bolts to the board. The case provides additional support for the antenna via a grommeted hole in the case top. The DSE field strength meter is priced at $39.95 plus $3.50 shipping and handling.

For more information about this and other DSE products, circle number 216 on your Reader Service card.

LARSEN AD-2/70 ANTENNA DUPLEXER

The new AD-2/70 dual-band antenna coupler has been released by Larsen Electronics, Inc. The AD-2/70 allows operation of separate 2m and 70-cm radios connected to a common dual-band antenna; it also allows separate 2m and 70-cm antennas to be used with a single-port, dual-band radio.

Larsen's model AD-2/70 antenna duplexer for 2m/70-cm.

Gross band isolation is suppressed to −50 dB or more, permitting interference-free simultaneous transmission or reception. Maximum power rating is 200 W PEP composite VHF/UHF power.

For more information about the Larsen AD-2/70, circle number 207 on your Reader Service card.

SOLDERING/DESOLDERING STATION BY SIBEX

Sibex, Inc., has released its model S-2 soldering/desoldering station. The S-2 allows any standard soldering iron to be temperature-controlled through the use of a separate dc voltage converter. The desoldering tool is temperature controlled in the range of 450–700° F. A vacuum pump is incorporated into the unit for efficient desoldering; the pump switch is built into the desoldering handpiece. The S-2 has holders for soldering and desoldering tools and has a built-in tip-cleaning pad. The price of the unit is $289.95.

For more information about the Sibex S-2, circle number 206 on your Reader Service card.

The Kantronics KPC-4 Dual-Port Communicator.

The Sibex S-2 temperature-controlled soldering/desoldering station.

ICOM IC-761
A NEW ERA DAWNS

- **Built-in AC Power Supply**
- **Built-in Automatic Antenna Tuner**
- **SSB, CW, FM, AM, RTTY**
- **Direct Keyboard Entry**
- **160-10m/General Coverage Receiver**
- **Passband Tuning plus IF Shift**
- **QSK up to 60 WPM**

The IC-761 ushers in an exciting new era of amateur radio communications; an era filled with all the DX'ing, contesting, and multi-mode operating pleasures of a fresh new sunspot cycle. The innovative IC-761 includes all of today's most desired features in a single full-size cabinet. This is ham radio at its absolute best!

Work the World. The IC-761 gives you the competitive edge with standard features including a built-in AC power supply, automatic antenna tuner, 32 fully tunable memories, self-referencing SWR bridge, continuously variable RF output power to 100 watts in most modes, plus much, much more!

Superb Design, Uncompromised Quality. A 105dB dynamic range receiver features high RF sensitivity and steep skirted IF selectivity that cuts QRM like a knife. A 100% duty cycle transmitter includes a large heatsink and internal blower. The IC-761 transceiver is backed with a full one-year warranty and ICOM's dedicated customer service with four regional factory service centers. Your operating enjoyment is guaranteed!

All Bands, All Modes Included. Operates all HF bands, plus it includes general coverage reception from 100kHz to 30MHz. A top SSB, CW, FM, AM, and RTTY performer!

Passband Tuning and IF Shift plus tunable IF notch provide maximum operating flexibility on SSB, CW, and RTTY modes. Additional features include multiple front panel filter selection, RF speech processor, dual width and adjustable-level noise blanker, panel selectable low-noise RF preamp, programmable scanning, and all-mode squelch. The IC-761 is today's most advanced and elaborate transceiver!

Direct Frequency Entry Via Front Keyboard or enjoy the velvet-smooth tuning knob with its professional feel and rubberized grip.

Special CW Attractions include a built-in electronic keyer, semi or full break-in operation rated up to 60 WPM, CW narrow filters and adjustable sidetone.

Automatic Antenna Tuner covers 160-10 meters, matches 16-150 ohms and uses high speed circuits to follow rapid band shifts.

Complementing Accessories include the CI-V computer interface adapter, SM-10 graphic equalized mic, and an EX-310 voice synthesizer.

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SSB 2.1 kHz, 8-Pole—Exact replacement for FL-44A. **Model IR455H1.05X—$99**

•ICOM IC-271/471/1271 CW 400 Hz, 8-Pole—Great for DXing or EME.
Model IR10.7H400C—$115

•Kenwood TS-930/940/830/R-2000 CW Super Selective 250Hz 8-Pole 455 kHz Filter—Comes mounted on high-quality glass PC board for the TS-930 and TS-940, drops into the TS-830.
Model IR455H125C—$125

•TS-940/930/830 Super Selective CW Switch Kit—This new kit allows you to add another CW bandwidth. For example, on the 930/940/830, if you already have 400 Hz or 500 Hz filters installed, you can now select a set of IR1250Hz filters. Our 250 Hz matched set allows for a lower noise floor for super quiet DXing.

•9 mHz 8-Pole Crystal Filters for Experimenters—
All 8-Pole Filters—**$60**
All 6-Pole Filters—**$50**

For SSB	For FM
A. 2.4 kHz @ 6 dB	A. 1.5 kHz @ 6 dB
B. 2.1 kHz @ 6 dB	B. 30 kHz @ 6 dB
C. 1.8 kHz @ 6 dB	**For CW**
D. 2.2 kHz @ 6 dB	A. 600 Hz @ 6 dB
★E. 2.2 kHz @ 6 dB	★B. 600 Hz @ 6 dB
For AM	★(6-pole)
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★B. 6.0 kHz @ 6 dB	

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ATV

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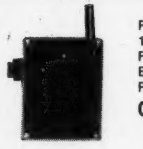

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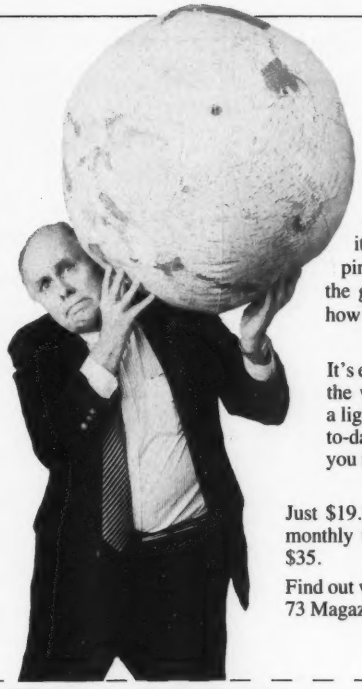

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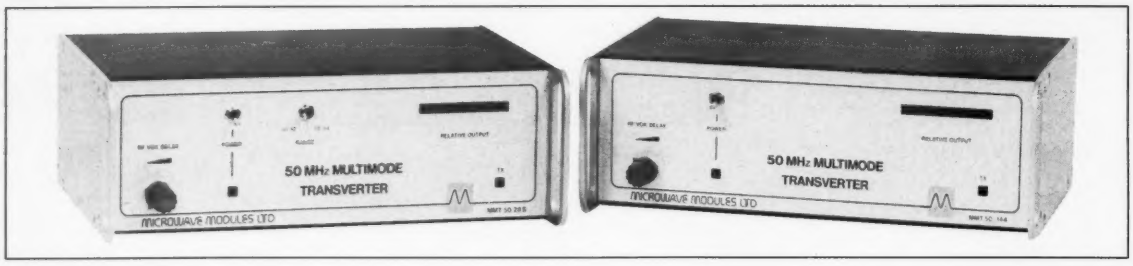
73 Review

Microwave Modules MMT 50/144 and MMT 50/28S 50-MHz Linear Transverters

by Peter H. Putman KT2B

Imported by: The PX Shack 52 Stonewyck Drive Belle Mead NJ 08502 Price class: $350



It's been a long time coming, but Microwave Modules Ltd. of Liverpool, England, has finally brought out the six-meter counterpart to the two-meter MMT 144/28R (reviewed in the March, 1986, issue). Back then I was impressed enough with the MMT 144/28 that I (and many other VHF operators) started badgering Ivars Lauzums of The PX Shack (the U.S. importer) to "get a version of this on six meters!"

Things do move at a different pace in England, however. The factory was in the midst of developmental work on a six-meter transverter when the big news came out: British amateurs would obtain limited 50-MHz privileges with a power restriction of about 20 Watts and 7-dB-gain antennas. I'm sure this lit a fire under the designers at Microwave Modules, as word soon came from Ivars: "No problem. The six-meter units will be in by Dayton!"

Well, Dayton '86 came and went. So did the rest of the summer and the entire Es season, and still no sign of the alleged boxes. About November, however, I received word that some prototype units were on their way to the U.S. Upon arriving, though, they turned out to be 50/144 types, with a two-meter i-f instead of the more conventional 28-MHz i-f.

Why was this? It seems that the folks in Liverpool suspected that the class B licensees (VHF only) would be the ones to get the new 50-MHz privilege, and since it stood to reason that most of those operators had either existing multimode transceivers or transverters for the two-meter band, a 50-MHz to 144-MHz conversion made sense.

However—initially only the class A licensees obtained the 50-MHz allocation, and they preferred the standard ten-meter i-f scheme. (Class B licensees wouldn't come on board for a few more months.) So much for trying to predict the market. It was back to the drawing board in Liverpool!

To make a long story short, my initial exposure to this new product was with the MMT 50/144, and it works surprisingly well—so much so that, if you prefer the 50-to-144 conversion scheme, you won't give up much to your counterparts on ten meters. I'll touch on the technical aspects later on, but right now I'll take a brief look at the 50/144.

The MMT 50/144

The layout is similar to the MMT 144/28R, with a low-profile extruded aluminum housing that forms part of the power amplifier (PA) compartment heat sink and affords excellent shielding. The main power switch is located on the front panel, along with the VOX dropout delay adjustment. A series of LED indicators make up a bar-graph display to show relative output power, with full indication meaning that the transverter is running at about 20 Watts. Since i-f coverage is from 144–148 MHz, no bandswitching is required for full six-meter ranging.

On the rear of the MMT 50/144 are three coaxial connections and one power/keying connection using the standard MM 5-pin plug. The connection at 144 MHz is full transceive, with all T-R switching done internally. A resistive pad is incorporated into the design to allow direct drive with two-meter radios of up to 15 Watts output (great news for all you folks who always forgot the 15-dB attenuators and blew out the old 50/144 units). Provision is made through the rear panel to adjust the input drive level for full output. This adjustment will accommodate transceivers from 150 milliwatts to 15 Watts.

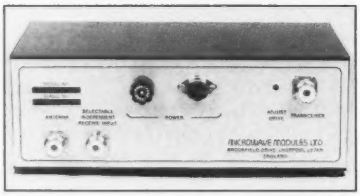


Photo A. Rear panel of the MMT 50/144.

Photo B. Rear panel of the MMT 50/28S.

Provisions have been made for two different antenna connections at 50 MHz, largely due to some of the aforementioned "badgering" of the U.S. importer and the factory representatives at Dayton. It would appear that most hams in the UK prefer the full-transceive scheme on VHF frequencies, since most of them run solid-state power amplifiers after their transverters.

On this side of the pond, however, we have our share of high-power ops using all sorts of complicated relay-switching schemes. The answer on the MMT 144/28R was simply to punch another hole in the housing and add a dummy SO-239 connector to be wired as an option by the end user.

The solution on the MMT 50/144 is a bit more elegant, with a built-in slide switch selecting either the normal transceive route or the independent 50-MHz antenna input. This switch is accessible by removing the right side cover with the unit facing you. Now you can run mast-mounted preamps with two feedlines, or an outboard tube amplifier with a conventional SPDT relay and keep it simple. The separate receive input lends itself to an outboard preamp, which, as the test data shows, might be useful in certain instances.

Take a look at the main i-f board. The workmanship here is first-class, with a double-sided plated G10 epoxy board used. You'll notice right away the preponderance of toroids, and this is no accident. The designers of the MMT 50/144 wanted to obtain fairly broadbanded performance in both the receive and transmit sections, eliminating the need for critical alignment or fine-tuning.

With the proximity of television stations on channel 1 along the coast of Belgium and

The Netherlands, there was concern about possible interference to these services by the new UK 50-MHz allocation. Other concerns were voiced about interference to channels 2 and 3 as well, not to mention the FM broadcast band.

Microwave Modules has addressed this problem by providing extensive filtering in both the RX and TX lines. For example, an incoming 144-MHz TX signal is downconverted to 50 MHz and immediately passes through a low-pass filter after the dual-balanced mixer. After passing the buffer amplifier, it is routed through a bandpass filter which has reasonably tight skirts.

Next, a 2N4427 is used as a pre-driver stage and is followed by yet another low-pass filter. Finally, the signal passes through driver stage MRF237 and the final amplifier, a pair of 2N6082 devices, before it sees one last low-pass filter at the antenna jack. That's a lot of filtering! When was the last time you saw a six-meter rf amplifier chain with that lineup?

Incidentally, the 2N6082s are run well below their ratings, as a single device has a case dissipation rating of 65 Watts and delivers 25 Watts output at 150 MHz! The two employed here are set to run no more than 20 Watts output—don't worry about overheating.

The RX line looks pretty much the same. Incoming signals at 50 MHz are routed through a high-pass filter and into a pair of J310 JFETs operating in parallel. Next in line is a 50-MHz bandpass filter (the same one used in the low-level TX line) and another pair of J310 JFETs, this time working as a dual-balanced RX mixer. You guessed it—another bandpass filter follows (this one operating at 144 MHz), and the signal is then amplified by a 2N5109 to provide a sufficient output at two meters and overcome the 6-dB transmit pad.

I should pause and note here what some readers might already be suspecting: The front-end performance of the MMT 50/144 is not "hot" in the same sense that the MMT 144/28R is with its GaAsFET and diode mixer. What qualifies the MMT 50/144 and the MMT 50/28S in the "high-performance" category is the resultant dynamic range available from running low-level RX amplifier and mixer stages. However, the sensitivity of the unit is on par with most other 50-MHz equipment currently on the market.

It's pretty difficult to overload those J310s, and even harder to blow them to kingdom come in high rf fields. Contrast that with your garden variety GaAsFET, which rolls over and dies when lightning strikes 50 miles away or when your dog rubs its back on the carpet in the next room.

The MMT 50/28S

Now let's take a look at the MMT 50/28S, which followed its brother over the ocean by about two months. It is very similar in appearance to the 50/144. The big difference is the bandswitch, which allows coverage of either the 50–52-MHz or 52–54-MHz segment. This eliminates the need to make any modifications to your ten-meter equipment to obtain full coverage and is an option that was not available on the original 50/28.

Specification	MMT 50/144	MMT 50/28S
Minimum Discernible Signal, 1-kHz bandwidth	−124 dBm	−124 dBm
Signal for 10-dB S/N	.75 uV	.8 uV
Conversion Gain (dB)	10	18
1-dB Compression, output (dB)	+10	+15
Dynamic Range (dB)	124	121
Measured Power Output saturated @ 50 Ohms	19 W	20 W
Minimum Drive for full output	500 mW	.5 mW
Dc Current Draw	4 A @ 13.8 V dc	4 A @ 13.8 V dc

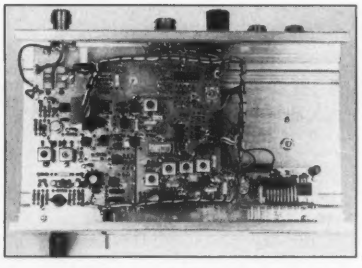


Photo C. MMT 50/144 i-f board. Note the 15-W resistive pad near the upper left corner.

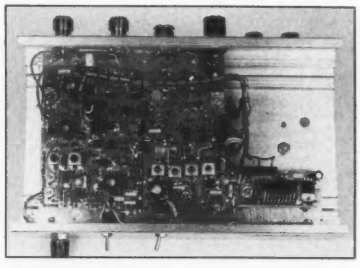


Photo D. MMT 50/28S i-f board. Note the switched low-level amplifier stage in the upper left corner.

The rear-panel layout is just like the 50/144 with the exception of separate 28-MHz TX and RX connections. You cannot use transceive connections on ten meters unless you employ an external relay at this point.

The lineup on the 50/28S is also similar, with the exception of lower drive levels at the input port. To accommodate a wide range of users, the factory has provided an on-board amplifier to boost very-low signals (5 mW or less) up to an acceptable level for the TX mixer section. If you have only this drive available, you'll need to engage the switch at the rear left-hand corner of the transverter (as viewed from the front).

The switch is easily seen on the main i-f board. The units come configured for a drive level of 300 mW, which is adjustable using the rear-panel potentiometer, as on the 50/144. The owner's manual gives a detailed description of how to set up the transverter to match your i-f requirements.

The TX and RX lineup is as described on the 50/144, with the exception of the booster amplifier in the low-level TX line. Incidentally, 2N5109 devices are used here and the circuit is broadbanded as well. J310s are used in the RX amplifier and RX mixer stages, and all of the bandpass, low-pass, and high-pass filters from the 50/144 are incorporated as well. An MRF237 is the driver, and a pair of 2N6082s produce 20 Watts while loafing along.

Both the 50/144 and 50/28S incorporate an ALC circuit, the level of which is not as adjustable as on the 144/28R. 20 Watts is what you see and 20 Watts is what you get! I suspect this was done primarily to allow the factory to breathe easier in the more restrictive UK market.

Performance Ratings

Now it's time to find out just how well the units work. For these tests, I employed both H-P 608F and H-P 8662 rf signal generators, a Boonton 92 millivoltmeter and H-P 8554-141T spectrum analyzer/i-f unit. Power measurements were made using the ubiquitous Bird 43 with 100-W, 25–60-MHz slug.

I was very interested in transmitter spectral purity, and looked at the output spectrum over two bandwidths, centering the signal at 50.000 MHz. Photos G and H are the spectral displays of the MMT 50/28S at 20-MHz/division and 2-MHz/division, while Photos E and F show the MMT 50/144 in the same bandwidths.

Note that the output of the 50/144 is exceptionally clean (for six meters), with a spur at 56 MHz falling 70 dB below the carrier. The 50/28S has a few spurs around the center frequency, with the strongest at 54 MHz falling about 45 dB below the carrier. There's a reason for this and I'll touch on it in a moment. For now, check out the numbers in the box.

I've highlighted the 1-dB compression measurements for a very good reason. They are outstanding, and if you're thinking of putting a high-performance preamp ahead of this transverter for weak-signal or scatter work, you'll appreciate what the designers had in mind.

Here's a system that will give a good accounting of itself in high-rf environments (e.g., during a contest when the band is open). The conversion gain on both units is such that neither should present an overload condition to the ten- or two-meter receivers employed at the i-f frequency. This also means more realistic S-meter readings without an attenuator.

The 20-Watt power level is ideal for driving an intermediate solid-state power amplifier in the 100–200-Watt class (such as the Mirage A1015). If 20 Watts is too much, simply cut

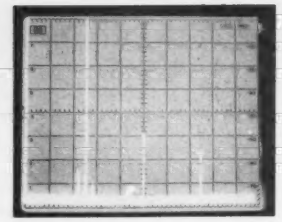


Photo E. Spectral output of the MMT 50/144. Each vertical division equals 20 MHz. The harmonic at 100.00 MHz is down −50 dB from the carrier.

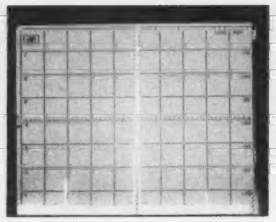


Photo F. Spectral output of the MMT 50/144 close in to the carrier. Each vertical division equals 2 MHz.

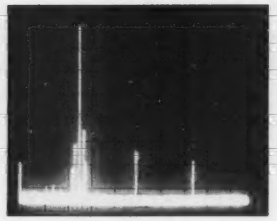


Photo G. Spectral output of the MMT 50/28S. The frequency tested is at 50.000 MHz. Each vertical division equals 20 MHz. The harmonic at 100.00 MHz is down −55 dB from the carrier.

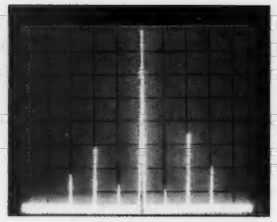


Photo H. Spectral output of the MMT 50/28S close in to the carrier. Each vertical division equals 2 MHz.

back on the injection level with the adjustable attenuator. Using this transverter with a tetrode tube power amplifier will easily result in a full kilowatt of output; the drive is a bit light for a grounded-grid system. Such amplifiers will run about 500 to 600 Watts output with either the 50/144 or the 50/28S.

I said I'd touch on the spurious performance of the MMT 50/28S, and those disquieting pips either side of the 50.000-MHz center frequency. Remember that the local oscillator (LO) here is running at 22 MHz (22 + 28 = 50). However, having the i-f so close to the LO frequency results in many close-in spurs that are harder to reject! This means sufficient output must be obtained at this frequency while considerable attenuation must be made of the harmonics that follow rather closely at 44 MHz and higher.

As you can tell from Photo H, the 44-MHz spur is down almost 65 dB from the carrier—not bad. Note also the 46- and 54-MHz spurs resulting from different mixing products. These are down 50 and 45 dB from the carrier, respectively, which is admirable since at least one falls within the skirts of the bandpass filter.

Consider the design of the 50/144 now, with its i-f at 94 MHz. It shouldn't be too hard to filter any spurious products from the LO that will fall at 188 MHz—that's 40 MHz higher than the i-f frequency. The LO is also running 44 MHz higher than the conversion frequency, so it's obvious you won't see any spurs from that area within the passband. Photos E and F bear this out. The two spurs that are evident at 44 and 56 MHz are down 65 and 70 dB from the carrier, which is more than satisfactory.

As I said earlier, you're not giving anything up by downconverting to six meters from two—heck, many of the best HF receivers available today upconvert to about 70 MHz and then downconvert so as to eliminate harmonics and improve spurious response. From an engineering standpoint, it works very well.

In Conclusion

I feel that the wait was worth it, especially since no other comparable product for 50 MHz exists on today's market. Both the MMT 50/28S and MMT 50/144 offer excellent overall performance with special attention to dynamic range and as clean a signal on transmit as is possible. The power level of 20 Watts might seem a bit light, but the spectral purity makes up for it.

Both units will lend themselves nicely to external preamplifiers as the end user sees fit, without unnecessarily degrading rf amplifier and mixer performance. Connections are easy to make (all connectors needed are supplied), the manual is well-written with several detailed schematics, and the unit is furnished in an attractive housing that looks great in the shack. Well done, Microwave Modules! Now. . . how about 432, and 1296, and. . . ?

For more information about Microwave Modules' 6-meter transverters, circle number 201 on your Reader Service card. ■

ICOM IC-μ2AT Two-Meter HT

by Jozef Hand-Boniakowski WB2MIC

ICOM America, Inc.
2380-116th Ave. NE
Bellevue WA 98004
Price class: $280

My wife JeanneE recently decided that she wanted to obtain a ham license. In short order she passed the Novice test and made arrangements to upgrade to Technician.

In anticipation of her passing the exam, we purchased an HT for use in her car and while she was away from home. The requirements were for a radio small enough to fit into a tote bag or shirt pocket, with ample features providing reliable access to two-meter repeaters (both PL-equipped and otherwise), DTMF tones for linking repeaters, and memory for ease of QSYing.

After looking at all the choices, we settled on the ICOM μ2AT. Small it is! The HT is 58 mm wide by 140 mm high by 29 mm deep. ICOM's ads in the ham magazines tout this by showing the radio resting in the palm of a hand.

Battery Packs

The ads, however, are a bit deceiving. They show the IC-μ2AT with the "optional" slim battery pack (BP-21) that does not come standard with the radio. The BP-21 adds 32.5 mm to the overall length of the radio, while providing 120 mAh at 7.2 V. The standard battery (BP-22) stands 62 mm tall and provides 270 mAh of service at 8.4 V. When the unit arrived, I was surprised to find out that my HT was taller than those pictured in the ads.

In addition to the batteries mentioned above, ICOM offers the BP-23 (600 mAh at 8.4 V) "for long life with normal power output of 1.6 Watts" The BP-24 (600 mAh at 10.8 V) is available for a high power output of 2.6 Watts. The BP-20 is a shell capable of holding six AA batteries or NiCds.

The problem with the shell is that although NiCds can be placed inside by the user, they cannot be charged there. ICOM probably guessed correctly that hams, being tinkerers, would buy the shell and go elsewhere for the NiCds to save money. So ICOM made it difficult to charge them. Now, since when did that kind of trick ever stop us?

The operating times of the battery packs, based on a 1:1:8 ratio of transmit, receive, and standby time, are: BP-21 two hours, BP-22 four and one-half hours, BP-23 ten hours, and BP-24 eight hours. While these figures seem to be conservative, I have found that the BP-22 is adequate for above-average HT usage.

All battery packs and the dc-dc converter slide onto the bottom of the radio and lock positively, so that there is no chance of accidental battery removal. A small slide switch under the PTT bar and LCD backlight push-button disengages the positive-locking feature.

The μ2AT comes with a plug-in wall charger supplying 27 mA of normal charge to the standard BP-22 battery. At that rate, it takes 15 hours to complete a full charging cycle. With the optional BC-50 desktop charger, at 400 mA, the task is accomplished in one hour. For mobile use a dc-to-dc converter can be purchased to produce 9.4 V dc from 13.8 V dc. This supplies enough power for approximately 1.5 Watts of rf.

Controls and Switches

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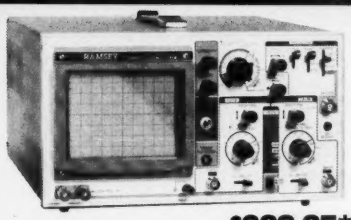

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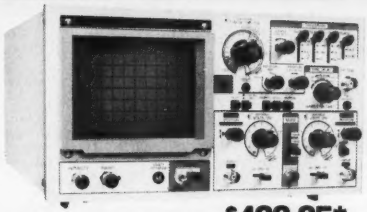

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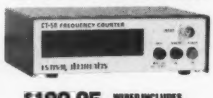

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CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100 mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

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offers you ten programmable memory channels with a backlit, green liquid-crystal display. The display is a pleasure to read both in direct sunlight and in a darkened vehicle. The green illumination can be turned on by pressing a white button just below the PTT button on the left side of the HT. An internal timer keeps the LCD illuminated for a few seconds after this switch is released.

Memory

The ten memories, unfortunately, do not store repeater offsets or simplex information independently. I find this to be the one major drawback in the use of the μ2AT. It seems silly to offer an HT with ten memories and force the user to reach to the back of the radio to set the duplex up/down/off switch to the proper position.

The standard repeater offset of 600 kHz is programmed into the μ2AT at the factory for all ten memories. It can be changed by turning the power off, setting the duplex/simplex switch to either up or down, holding down the white light (backlit LCD) switch while powering up the radio, and changing the LCD readout of 0.60 to the desired new offset. Pressing either the PTT or CHK (more on this later) switch places everything back to normal. The offset frequency can be set up to 39.995 MHz.

There are four up/down slide switches on the top of the radio. From left to right, they are memory channel, 1 MHz, 100 kHz, and 10 kHz. Frequency programming is accomplished by choosing a memory channel by number (0–9) and entering the frequency directly. The frequency entered is automatically stored in that memory channel.

There is no 5-kHz on/off switch, as the 10-kHz switch causes the LCD to increment, up or down, in 5-kHz steps. The LCD shows "0" or "5" smaller than the other numerals, at the extreme right of the readout, to indicate whether it is in effect. This simplified approach to memory programming eliminates the need for a separate entry button and/or procedure.

On the side of the radio is a frequency-lock up/down slide switch that disables the frequency-select switches, an important feature since the frequency-select switches are so small. The lock prevents accidental frequency changes.

An internal battery (good for one to two years) prevents memory from being lost during periods when the battery pack is being changed or when the μ2AT is being hooked up to an external power source—i.e., the dc–dc converter.

The μ2AT comes with a 16-digit DTMF pad on the front face and an internal subaudible tone generator for use with controlled-access repeaters or other tone squelch systems using standard CTCSS tones. The DTMF pad keys are very small, but then that's the price you pay when you buy a micro HT.

The CTCSS tones are programmed by removing the battery pack and setting a series of seven DIP switches located at the bottom of the transceiver. Thirty-eight different CTCSS tones can be set by using the tone-frequency table supplied with the manual.

However, only one tone can be selected at a time, and this is another item that cannot be programmed into memory. It would have been a sheer joy to be able to program a different tone for each of the ten memory channels. Here in central Vermont, where the New England Network links up to 14 repeaters, such a feature would be a blessing.

In addition to the above controls, switches, and LCD display, the top of the radio features a power/volume control, a (very) small squelch knob, a BNC female antenna connector, a TX/battery recharge light, and a CHK momentary push-button switch. This CHK button places the μ2AT in reverse-split mode, which is handy for checks to see if the station you're working is within simplex reach. The LCD has the typical segmented S-meter readout.

Performance

The receiver's sensitivity is good and has been more than adequate for use in the mountainous terrain of central Vermont. The receiver covers roughly from 130–170 MHz, which allows for interesting listening in the public service, weather, and other bands. Here in the snow belt, it's nice to have 162.55 NOAA weather at your fingertips and within your HT.

The ICOM IC-μ2AT two-meter HT shown with standard BP-22 battery pack.

Different 10-MHz band segments cause the LCD to display a small rectangle(s) or lack of same just to the left of the actual frequency readout. For instance, when you're receiving in the 130-MHz band, no rectangle is displayed; one is displayed for the 140-MHz range; two for the 150-MHz range; three for the 160-MHz range; and four for the 170-MHz range.

The transmitter puts out a clean-sounding signal. Audio (and convenience while mobile) can be improved with the addition of an external microphone. ICOM offers various headsets with and without VOX control and the IC-HM9 external speaker-microphone. The μ2AT instruction manual contains circuit diagrams for those wanting to incorporate other microphones or microphone elements.

The IC-μ2AT follows in the footsteps of its big brothers, the IC-2AT and the IC-02AT, in using one line for both audio and PTT functions. There are two jacks, one subminiature and one miniature, on the right side for external speaker/mike connections. The spacing between them is the same as on the 2AT/02AT, so an upgrade to a μ2AT does *not* make some external accessories obsolete.

In addition to the up/down/simplex switch on the back of the radio, there is a high/low-power switch. With the stock BP-22 battery, high power is 1 W, while low power becomes 0.1 W.

Manual

The instruction manual supplied with the μ2AT is barely adequate. It was written more for the appliance operator than for the amateur with a need for more information. There is the typical information about rig usage plus a few cautions about use of strong cleaning agents, avoiding weather extremes, etc. A most interesting quote is "DO NOT disassemble the transceiver as it may cause trouble." Now, who would do such a thing?

A Dream HT

The μ2AT, with only its few shortcomings, is an HT-lover's dream radio. The last time I saw our μ2AT was at the Albany, New York, VE testing session! My wife promptly claimed it after answering 48 out of 50 questions correctly. KA1PMS is available daily for QSOs on 145.390 MHz and on the New England Network. On her way out, someone gave her a copy of the Advanced-class ARRL manual. Who knows? Today a μ2AT, tomorrow a 50-foot tower.

The μ2AT also makes you wonder just how small a packet station can be? With a miniature GLB battery-powered TNC and a pocket computer, it would be tough to get much smaller.

ICOM also makes the IC-μ4AT for the 440-MHz band. It's only a matter of time before the complete 2AT/02AT line is duplicated in micro version. The μ2AT is an enjoyable radio offered at an enjoyable price. Now, how about a dual-band micro HT?■

SPEECH

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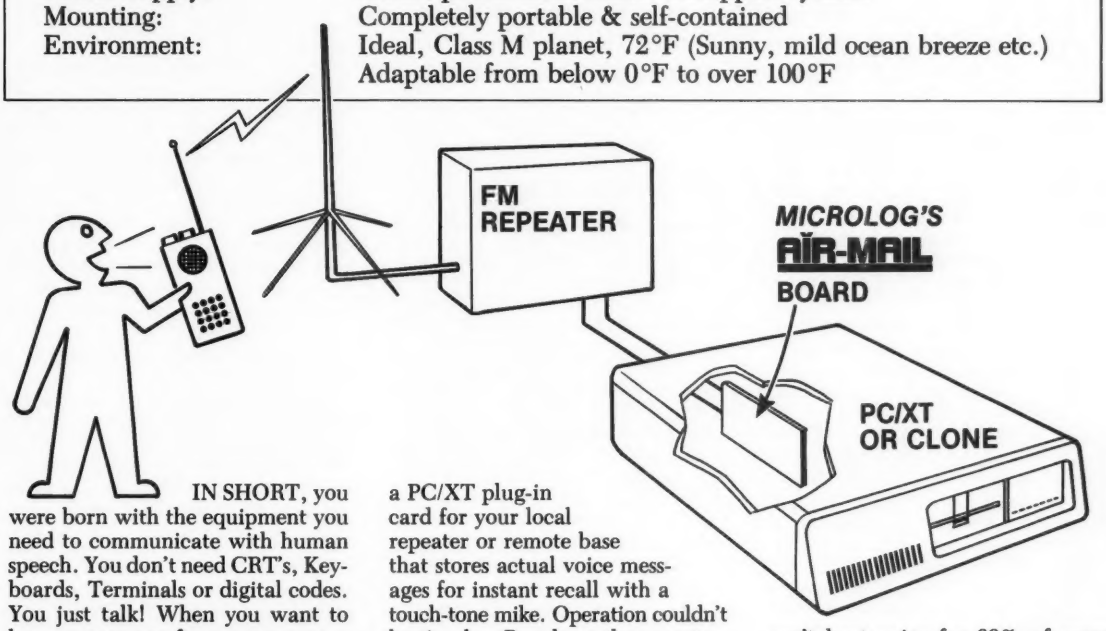
Transmission medium:	Air
Data rate:	200 WPM optimum
Auto-Sync:	Instant auto speed lock 0 to over 300 WPM
Code:	Any language
Output level:	0 to >100 db
Power Supply:	Draws power from main life support system
Mounting:	Completely portable & self-contained
Environment:	Ideal, Class M planet, 72°F (Sunny, mild ocean breeze etc.) Adaptable from below 0°F to over 100°F



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BRINGING A PERSONAL VOICE TO MASS COMMUNICATIONS

Dick Smith Electronics Function Generator Kit

by Thomas S. Rowinski KA1MDA

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Price class: $70

As an electronics technician, I'm always on the lookout for test gear for the workbench or shack. When my forty-year-old audio signal generator finally bit the dust, I decided it was time for a new piece of gear to take its place. Luckily, I found exactly what I was looking for in a friend's Dick Smith Electronics catalog: the K-3520 function generator kit. It was inexpensive ($69.95), attractive, and had pretty decent specs.

The DSE K-3520 boasts a four-digit LED frequency display and covers 10 Hz to 170 kHz in three ranges. The specs also list an output of 2.5 volts peak to peak into 600 Ohms and an amplitude stability of .1 dB. The output waveform can be switched between sine, square, and triangle waves. Considering the price of the unit, these are impressive specs. I couldn't wait to test the assembled unit!

Assembly

The kit was relatively straightforward and went together in one very long night. I would definitely call this a two-evening kit! I don't recommend it to beginners, although anyone who has ever home-brewed a project or built a kit before should have no problems if he follows the instructions carefully.

Keep in mind that this is not a Heath-type kit. There are no parts layouts screened on the PC boards, nor are there any step-by-step instructions for assembling every piece that comes with the kit. Instead, you are instructed to mount groups of components per each step. You are told to install all the jumpers first, then the capacitors, then the resistors, etc. As long as you keep a close eye on the parts layout in the manual and highlight each component after it's installed, you should experience no problems during assembly.

The kit itself consists of three PC boards, the case assembly, and assorted hardware. The large main board is assembled first, the display board second, and the small timebase board last. Finally, the boards and hardware are installed in the case. Since the timebase board is used only in the U.S. version, it is not mentioned in the manual—it comes with its own data sheet.

I encountered only a few assembly quirks with my unit. DSE does not provide sockets for the chips: You are instructed to solder the ICs directly to the board. Play it safe: USE SOCKETS and do not install the chips until everything else is finished and ready to be powered up!

DSE also uses a strange way to label resistors: 2k5 means 2.5k Ohms. For whatever reason, the drilling template supplied with the timebase board was incorrect. Put everything else together first, then mount the board in a clear spot on the rear panel. On the front panel, the baton on the range-selector switch was shorter than the other two switches.

"The K-3520 function generator kit offers amazing performance for an even more amazing price!"

When mounting the board, insert the switch leads only far enough into the PC board to solder the tips of the leads to the foil pads. This will just about even out the length of the front-panel switches. The trickiest part of the kit involves soldering the display board to the main board at a 90-degree angle. An extra pair of hands here makes the job much easier. Tack-solder the two outside traces first and test-fit the assembly by sliding it into the case. If all is well, finish soldering the rest of the traces.

Finally, the unit is powered by a 120-volt transformer, but provides no line fusing. I installed a fuse holder on the rear panel and used a .5-A fuse in the hot line (black wire on the line cord) before the power switch for safety.

Aside from these problems, the kit went together painlessly. DSE provides more than enough solder and hookup wire to complete the kit. I want to stress that the above problems were all minor in nature, and I really enjoyed putting this kit together. Six hours into the project, I was ready to insert the chips and run the smoke test.

Test Results

My unit fired up and ran on the first try. There were a few bugs present, but it ran. The first step in calibrating the unit involved setting the timebase oscillator to 3579.545 kHz. Initially, I could not trim the frequency down far enough. Removing the 39-pF capacitor across the trimmer solved this problem. The amplitude, offset, and distortion adjustments all went off without a hitch. (The calibration procedure in the manual is written quite clearly and offers two methods of calibration—for those with and without other test equipment.)

There was a small bit of residual distortion superimposed on the output of the X100 range. I suspect it was multiplexing noise from the display/driver circuit. Bypassing the main voltage regulator ground to the power cord ground through a .5-mF, 600-volt capacitor eliminated the distortion.

Finally, the LED frequency display would not latch in the X100 range. The manual mentions this problem and suggests delaying the clock pulses with a 100-Ohm resistor. I had no luck. Through some experimentation, though, I found that a 15k-Ohm resistor in the delay line solved the problem and the display ran perfectly.

So, how did my unit compare with the published specs? It came quite close. Output was 2.00 volts p-p and was flat from 10 Hz to 25 kHz, where it began to very slowly dip down a bit. Response was down −0.91 dB at 95 kHz and −1.5 dB at 155 kHz. Range extended from 10 Hz to 155 kHz.

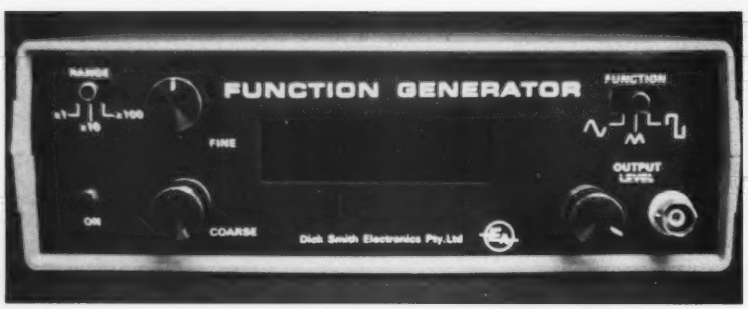

Photo A. Front panel of the Dick Smith Electronics Function Generator.

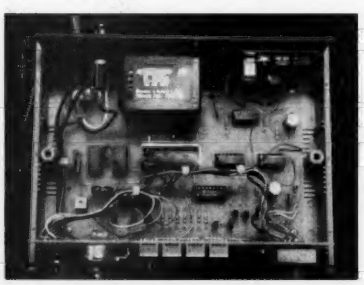

Photo B. Inside view of the completed and modified kit. Note the fuse holder at the upper left, the trimpot at the lower left, and the bypass capacitor at the bottom left behind the pots. A new frequency-adjusting pot is below the visible pot.

The digital display was accurate to ± one digit. In typical use, this resulted in a maximum indicated display error of 50 Hz at 155 kHz. From a cold start, frequency drift was −3 Hz in the first two hours. After warmup, total drift in eight hours was 1 Hz. Power consumption was 6 Watts at 120 volts. Needless to say, I was impressed with the unit's performance.

Modifications

After using the K-3520 for a few weeks, I became aware of a few shortcomings and set out to modify the kit. I found that the clean, open component layout, clear schematics, and detailed circuit description in the manual open up this kit to all sorts of modifications. An experimenter's dream!

Due to the circuit design, the frequency-adjustment range is very nonlinear. DSE tries to get around this by providing a coarse- and fine-adjustment pot. This helps a little, but it still gets touchy in spots. I found that replacing the 1-Meg linear taper "coarse adjust" pot with a 500k-Ohm, reverse-audio taper pot made the unit much easier to adjust. If a reverse audio taper pot is not available in your area, you could use a standard audio taper wired for reverse operation. It still isn't linear, but it's much better than before.

The only drawback is that this mod raises the bottom frequency limit from 10 to 20 Hz. Since I use my unit for audio work, this was not a problem. I also replaced the 4.7k-Ohm resistor in series with the pot with a miniature PC-mount 10k-Ohm linear taper pot. This modification allows setting of the unit's high-frequency limit anywhere between 75 and 400 kHz! Keep in mind, however, that this is a compromise. The higher the top limit, the more nonlinear the frequency-adjustment range becomes.

With these two mods, you can tailor the response limits to allow greatest adjustment ease for any given application. I strongly advise caution when you're experimenting above the unit's rated 170-kHz limit. Although the output stage in my kit survived numerous visits beyond 500 kHz, the output stages in a supposedly "wideband" amplifier under test did not! Above all, assemble the kit according to instructions first. Do not make any changes or modifications until you are sure everything is working as it should!

Conclusions

It has been well over three months since I assembled my unit, and I am both impressed and pleased with its performance. It is a well-designed, easy to use, and attractive piece of equipment. There are many small touches in its design that show the quality of this kit. All in all, this is a fine piece of gear. Congratulations to Dick Smith Electronics for coming up with a winner. The K-3520 function generator kit offers amazing performance for an even more amazing price! ■

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Repeater Renaissance

Digital audio technology will bring your mountaintop monster into the information age.

Ed Ingber WA6AXX is the president of Advanced Computer Controls, Inc.

Digital audio has revolutionized the world of hi-fi and stereo. It's even turning up in the new generation of 8-mm VCRs. Ultimately, digital transmission schemes will replace today's analog frequency modulation, which is common in amateur and commercial radio communications systems. That time is still off in the future, but digital audio techniques can be applied to today's repeater—for remote recording and playback of information through the repeater.

History

Repeaters first served as relays for mobile operation. The communications range at VHF is limited due to line-of-site propagation; the range of mobile and hand-held stations is further restricted by low power and relatively poor antennas. Relaying signals from mobiles and portables and interconnecting to the phone line (autopatching) were the principal functions of repeaters until the early 1980s. At that point, repeater control systems became remotely programmable. Speech synthesis technology was introduced to repeaters at the same time.

The new combination of remote programming and speech synthesis introduced a brand new capability in amateur repeaters—the ability to convey information generated by the repeater (such as meter readings and other telemetry) and information loaded by the repeater owner, remotely. The repeater was on the road to joining the information age . . . to becoming an information center.

Digital Audio For Your Repeater

Digitizing audio on amateur repeaters for record and playback offers a different set of benefits than in the world of high fidelity. Audio fidelity is limited by various components in the radio system, such as inexpensive microphones and speakers, and, ultimately, the channel space available for transmission. Although radio audio quality is relatively "low-fi," you certainly want to take advantage of the audio quality you do have to work with. It's important not to degrade the quality of the audio that you record and play back through your repeater.

The benefits of digital audio in repeater systems spring from the fact that the audio can be stored in computer memory chips, rather than on an optical medium (such as a CD). Storage in computer memory brings with it instant "track" selection and queuing, no mechanical wear, resistance to harsh environments, full repeater fidelity, and easy remote recording. In addition you have the miraculous control capabilities of the microcomputer!

How Audio Is Digitized

Like all real-world signals, audio is inherently analog. But like any analog signal, audio can be digitized. That is, it can be represented as a sequence of digital "words" that describe the instantaneous amplitude of the audio waveform at sequential points in time.

The larger the digital word representing the amplitude, the greater the resolution, which, in audio terms, translates to a better signal-to-noise ratio and a higher dynamic range. This is because a larger digital "word" offers more possibilities for representing the amplitude, so that each representation is more accurate. Each analog "sample" is rounded off to the closest digital representation. A four-bit word allows 16 amplitude possibilities, while an eight-bit word allows 256 (see Fig. 1). At each point in time, the audio waveform is "sampled" and

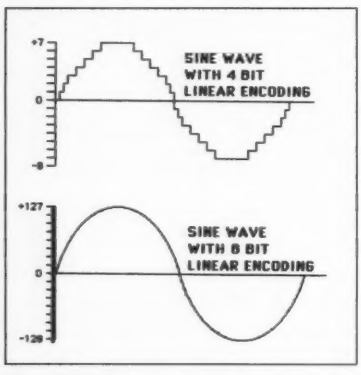


Fig. 1. Each analog "sample" is rounded off to the closest digital representation. A four-bit word allows 16 amplitude possibilities, while an eight-bit word allows 256.

Track #	Contents
14	Welcome to Silicon Valley.
15	This is WA6AXX, Repeater.
16	Press touchtone 3 6 for information about the system.
17	This is two twenty four six eight,
18	From Black Mountain,
19	Running 35 Watts above Cupertino.
20	Press touchtone 3 7 for autopatch information.
21	Listen for the Westlink Amateur Radio News, Monday nights at 7:30, right here.
22	Be sure to attend the West Valley Radio Club meeting, the first and third Wednesdays of each month at the Los Gatos Red Cross building.
23	There has been an unauthorized intrusion. The police have been notified. If you're in the repeater site area, please proceed to the site to help investigate.

Fig. 2. Audio "tracks."

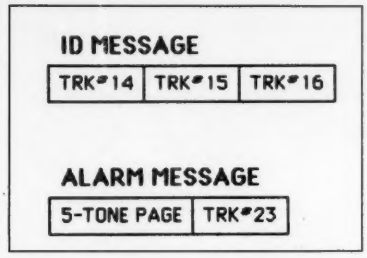


Fig. 3. Message construction with voice-recorder track.

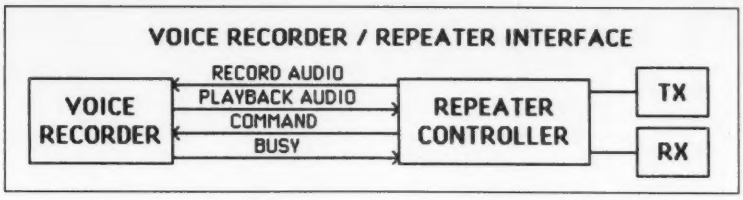


Fig. 4. Voice-recorder/repeater interface.

"quantized"—that is, approximated to the nearest digital representation.

The more frequently the audio signal is sampled, the higher the frequency signal that can be accurately reproduced. If a 1-kilohertz signal is sampled only every few milliseconds, then there isn't enough information obtained to reconstruct the signal accurately.

An analog signal needs to be sampled at a rate at least twice the highest frequency component that needs to be preserved. All the frequency components above half the sample rate should be filtered out before the signal is sampled. Otherwise, these signals "wrap around" and appear as "aliases," or in-band noise and distortion, which cannot be removed once recorded.

Compact disc systems use 16-bit digital words sampled at 44.1K samples per second. This provides for a 96-dB dynamic range and signal-to-noise ratio, with frequency response extending past 20 kHz—quite an improvement over LPs! For your purposes, you simply want to preserve the full fidelity of your amateur repeater when it is digitally recording, so that a 50-dB signal-to-noise ratio, 1% or so distortion, and 4-kHz frequency response will sound identical to the original.

Data Compression

You want to store your audio in as little memory as possible without compromising the audio quality you obtain through your repeater system. That means that you can borrow a simple data compression technique used in the telephone industry called "companding."

This clever technique lets you use fewer bits to represent each analog sample by compressing and expanding the signal during the analog-to-digital and digital-to-analog conversion process. This effectively reduces the dynamic range needed to represent your digital word. With companding, you can use an eight-bit word to achieve the performance of a non-companded, or linear, 12-bit word.

The analog-to-digital converter performs this compression by varying the quantizing step size over the amplitude range. Small signal voltages are quantized around small step sizes, while larger voltages are encoded around larger step sizes.

Direct analog-to-digital conversion of the audio signal, including the use of companding, is called waveform encoding. Other techniques exist for compressing the amount of digital data needed to store voice audio. This is because the human voice contains a large amount of redundant information. Other than companding, these techniques generally degrade the perceptible quality of the audio, relative to high-resolution waveform encoding.

Some data compression techniques, such as CVSD (continuously variable slope delta modulation) and ADPCM (adaptive differential pulse code modulation), involve hardware or software and rely on certain predictable characteristics and the built-in redundancy of human speech. These techniques are used in some communications systems where intelligibility, intonation, and naturalness need to be maintained, but where distortion and signal-to-noise ratio can be compromised.

Other techniques, such as LPC (linear predictive coding), achieve a high degree of data compression using extensive digital signal processing. Rather than encoding the voice waveform, LPC involves modeling the human vocal tract. Instead of storing waveform samples, parameters for the human vocal tract model are stored and require much less data.

The price paid is encoding complexity. Some speech synthesizers are actually digital voice playback devices using LPC for data compression. LPC will probably eventually be used in low-bandwidth digital voice transmission systems for two-way radio applications.

While data compression can preserve "communications quality" audio, you don't want your recorded audio to be simply intelligible—you want it to sound like the original. Companded PCM (pulse code modulation), or waveform encoding, offers what you're looking for.

Most data-compression techniques work at the "front end" as part of the recording process. By recording the digitized waveform directly instead, you retain the option of data compression using software before you store the information. In that way, you can preserve the full fidelity of the original for important, frequently heard recordings, and you can conserve memory for less important recordings where you can tolerate some degradation.

The conversion of an audio signal to digital words and back to an analog signal using companded PCM can be done with readily available chips called CODECs (short for "coder-decoder"). These chips are used in most digital telephone systems and PBXs. They've been available since the late '70s and have evolved in ease of use and performance. The 2916, a CODEC chip made by Intel, represents an advanced design. All CODECs are designed to meet or exceed telephone industry standards, and also happen to meet or exceed FM repeater audio standards.

Integrating Digital Audio Into an Amateur Repeater

The most obvious application of digitally recorded audio on a repeater is for its ID messages. In keeping with the goal of making the repeater an information center, the ID can be tagged with information of interest to the amateur community. If there's a club meeting later in the week, the ID can remind users of the meeting. The scheduled speaker for the meeting can record the ID and quickly promote his talk. It is important, however, that the repeater controller ensure that the announcements do not interfere with repeater users.

Other repeater messages can be remotely recorded to contain information of interest to users—tail messages, bulletin board messages, alarm messages, etc. These can contain information about meetings, nets, emergency situations, etc.

Voice Mailbox

Another obvious application of digital audio is in implementing a "voice mailbox." Large-scale digital audio systems attached to telephone PBXs provide a company's employees with enhanced communications by allowing them to leave digitally recorded voice messages. This helps eliminate the "telephone tag," which so often occurs in an office environment. On amateur repeaters, a user to whom you might like to mention something or ask a question may not be around when you are. A voice mailbox would let users exchange questions and information in non-real-time.

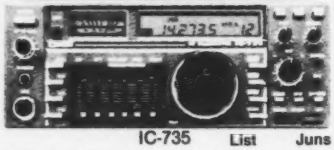
In addition to providing information to users, the repeater can be made more "friendly" by offering holiday greetings to users, featuring celebrities saying the IDs, introducing newcomers, and congratulating members on their good fortunes. If the repeater's courtesy tones are remotely programmable, distinctive sounds can be recorded to serve as the courtesy tone. In some repeater controllers, the courtesy tone can be a source of telemetry, or information relating to repeater or equipment status.

Talking to Yourself

Perfect audio reproduction will allow users to record a brief transmission so that they can hear how they sound through the repeater. This is useful for checking the audio quality of a new microphone or hand-held or

800-882-1343

ICOM



IC-735	List	Juns
IC-735 Gen. Cvg. Xcvr	$999.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
R7000 Gen. Cvg. Rcvr.	1099.00	Call $
R71A Gen. Cvg. Rcvr.	949.00	Call $
IC-27A/H FM Mobile 25w/45w	429/459	Call $
IC-28A/H FM Mobile 25w/45w	429/459	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-47A 440 Mobile 25w	549.00	Call $
IC-04AT UHF HT	449.00	Call $
IC-48A UHF 45w	459.00	Call $
IC-38A FM Mobile 25w	459.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $

KENWOOD

TS-440S/AT

TS-940SAT Gen. Cvg. Xcvr	$2249.95	Call $
TS-430S Gen. Cvg. Xcvr	819.95	Call $
TS-711A All Mode Base 25w	899.95	Call $
TR-751A All Mode Mobile 25w	599.95	Call $
TM-201B FM Mobile 45w	369.95	Call $
TM-2530A FM Mobile 25w	429.95	Call $
TM-2550A FM Mobile 45w	469.95	Call $
TM-2570A FM Mobile 70w	559.95	Call $
TH-205 AT, NEW 2m HT	259.95	Call $
TH-215A, 2m HT Has It All	349.95	Call $
TH21BT 2M HT	259.95	Call $
TH31BT 220 HT	269.95	Call $
TH41BT 440 HT	269.95	Call $

YAESU

FT 757GX

FT-757 GX Gen. Cvg. Xcvr	995.00	Call $
FT-767 4 Band New	1895.00	Call $
FT-270RH FM Mobile 45w	439.95	Call $
FT-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH RM Handheld 5w	359.95	Call $
FT-726R All Mode Xcvr	1095.95	Call $
FT-727R 2M/70CM HT	479.95	Call $
FT2700RH 2M/70CM 25w	599.95	Call $

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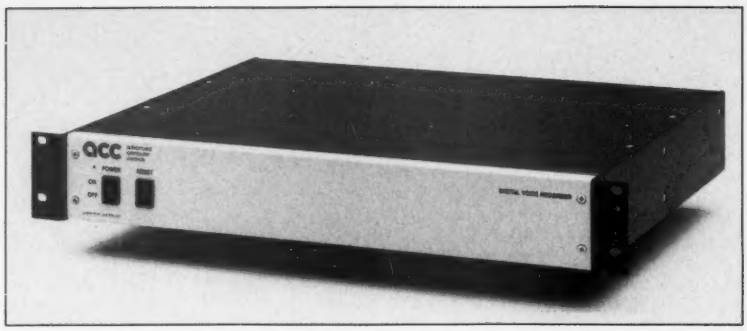

Photo A. This Digital Voice Recorder is made specifically for repeater use by Advanced Computer Controls.

High Fidelity	Repeaters
Freedom from surface noise	Instant track selection and queuing
High dynamic range	No mechanical wear
Ultra-low distortion	Resistance to harsh environments
No wow or flutter	Full repeater fidelity
No degradation	Easy remote recording
	Synergism with microcomputer

Table 1. Benefits of digital audio in hi-fi vs. repeaters.

to hear how well messages are getting into the system.

The Audio "Track"

Audio in a voice storage unit must be organized in a way that separates various recordings and makes them available for immediate use on demand. The simplest way to think of the unit of storage is as an audio "track."

The track is similar to, but differs in important ways from, tracks on an eight-track cassette player. In your digital recorder, each track contains a specific recording. The track is automatically made long enough to hold the audio you've recorded, and no longer. By automatically varying track length to match the particular recording length, you don't waste memory. Each track is immediately available for playback when commanded. Your microcomputer controller can provide for as many tracks as you'd like, since they're simply logical entities.

When a track is deleted, its space in memory is freed up to be available the next time you record that track or any other track.

Message Editor

Sophisticated repeater controllers with remote programming capabilities include a "message editor," which allows the repeater owner to remotely program the various messages generated by the controller. The remote programming can be accomplished with touchtone™ commands. The programmable messages can consist of Morse code, synthesized speech, paging tones, digital voice recorder tracks, and other external devices.

Using the message editor, you can construct IDs, tail messages, and bulletin boards that include voice recorder tracks. You can even join various voice recorder tracks together, so that some information needs to be recorded only once (such as the repeater's callsign), but can be used in multiple messages.

As an example of an ID message that you can construct using the tracks recorded in Fig. 2, join tracks 14, 15, and 16 (as shown in the top half of Fig. 3). The resulting ID playback is "Welcome to Silicon Valley. This is WA6AXX, Repeater. Press touchtone 3 6 for information about the system." You can also use these tracks in combination with other tracks in other messages, such as additional IDs and tail messages.

Another example of a progammable message is the repeater's response to an alarm condition (see the bottom half of Fig. 3). If an intruder breaks into the repeater building, the repeater can respond by announcing a preprogrammed alarm message.

Using the message editor, you can construct an alarm message that consists of (1) paging tones, to activate the control operators' selective call decoders, and (2) a digital voice recorder track that provides information on what to do in the event of the intrusion. The resulting alarm message might be "[five-tone sequential page]. There has been an unauthorized intrusion. The police have been notified. If you're in the repeater site area, please proceed to the site to help investigate."

Conclusion

The combination of sophisticated repeater controllers and digital audio recording techniques have resulted in another step in the amateur repeater's evolution into an information center. And they make operating a modern amateur repeater a lot more fun! ■

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Address _____

City _____ State _____ Zip _____

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104 Hunting Hills Lane
Media PA 19063

Packet RATS

WA3DNM's Resume-After-Transmit Scanner lets your IC-27A do double duty.

Shortly after joining the growing ranks of packeteers, I discovered that there was more packet activity in eastern Pennsylvania than first meets the eye. Activity is spread across 145.01, .03, .05, .07, and .09 MHz, so I quickly put the scanning feature on my ICOM IC-27A to good use monitoring the activity on all channels. My packet station consists of an ICOM IC-27A transceiver, a Kantronics Packet Communicator II, and a Radio Shack Model 100 portable computer acting as a terminal.

I like to leave the radio scanning the five active packet frequencies. My favorite command on the Kantronics Packet Communicator II is MH (monitor heard), which lists the last 18 stations heard, and with this command I can determine who has been active most recently.

After connecting with Bruce WA3WUL, who has extensive packet experience, I found out that my station location in Media is to be envied as a good digipeating location. Now, I realize that an elevation of 445 feet above sea level may not seem high to hams in the Rockies, but it is a Mount "RFerest" to the unfortunate packet operators living in this area's many rf holes and valleys. Bruce lives in one of this area's deepest valleys (Delaware), so I offered him the use of my station's digipeating capabilities (DIGI ON)—and with it my reliable access to the Delaware Valley's other packet stations.

Problem Time

When Bruce used my digipeater capabilities, he could connect to whomever he wanted, through my station, on whichever packet frequency he needed. By breaking the squelch and causing my radio to stop scanning, Bruce had a five-frequency digipeater.

Unfortunately, the 27A does not resume scanning after transmitting. So when Bruce digipeated through my station, the scanning stopped and the radio was stranded on the last transmit frequency until I happened to pass by the shack, notice the lack of scan activity, and restart the scan by pressing the S/S (start/stop scan) button. This, in effect, nullified my MH capabilities and doomed my digipeater to only intermittent, multi-frequency capabilities.

The Plot Always Thickens

A few months later, I installed a mini-mailbox system for the Model 100, written by Dick Roux N1AED. I started discussing my newfound capabilities to store messages with several friends and heard that Harry ND2P had only .01 crystals (he has since sprung for .03, as well), and Abe N3BBF could reach my station only via a digipeater in New Jersey on 145.05 MHz. Bruce still often digipeated through my station to access WB2MNF on .03 and K3PGB on .05. The only one who did not really care (except for academic interests) was Jon KR3T, who also had an IC-27A and could access me directly. Thus, I needed to cover several frequencies continually. The problem with the 27A's scan lock-up after transmit had to be resolved.

The Solution Is RATS

Enter RATS—Resume-After-Transmit Scanner. After a session reviewing 555 timer circuits plus the 27A's schematic, I discovered the answer to my problem in the form of an easily constructed 555 timer circuit. I even interfaced the RATS without soldering or modifications to the 27A. My RATS lives in a small plastic box on top of the radio; thus, no internal modification to the radio is needed. If you use the component and voltage values shown in the circuit in Fig. 1, the IC-27A will resume memory scan approximately 1.5 minutes after the radio's last transmission.

Construction

There is nothing unusual about the 555 timer circuit. It is a basic and time-proven design, based upon a circuit found in the Radio Shack 555 timer book (*Engineer's Mini-Notebook 555 Timer IC Circuits*, Forrest M. Mims III, P/N 276-5010). When pin 2 of the 555 goes to ground, the output goes high and the normally closed relay contacts

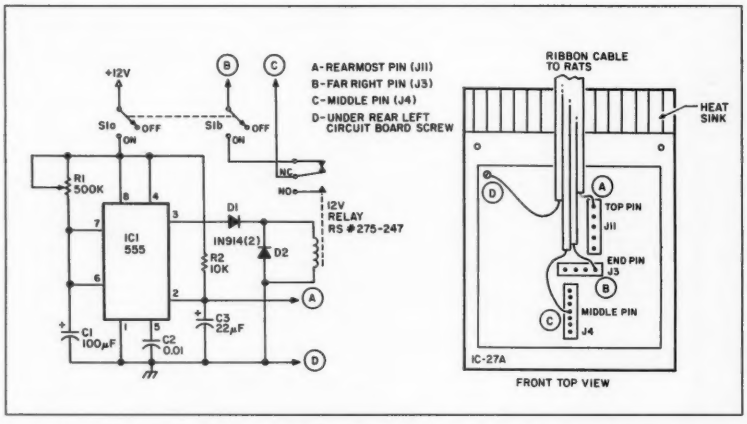


Fig. 1. Schematic and connections for RATS, the resume-after-transmit scanner.

open. After a period of time determined by the R1/C1 combination (which can be adjusted to suit your needs), the 555 resets, reclosing the relay contacts. This closes the S/S switch, causing the radio to resume scanning the memory channels.

My RATS was constructed using point-to-point wiring. I used four-conductor, multi-ribbon cable to connect RATS to the radio. After coating the four wire ends of the ribbon cable with enough solder to make a tight connection, I friction-fit the wires into the top of the necessary circuit board connectors on the radio's top board. I routed the cable over the 27A circuit board, out the back, and over the top of the heat sink. The top cover can be reinstalled with no difficulty, and it holds the connecting wires in place.

"An elevation of 445 feet above sea level may not seem high to hams in the Rockies, but it is a Mount 'RFerest' to the unfortunate packet operators living in this area's many rf holes and valleys."

Proper connections to the radio are shown in Fig. 1. Power for RATS comes from the same external, 12-volt power supply that powers the radio, although you may want to get power from inside the radio using two additional conductors.

Operation

After programming the packet frequencies into the memory (I fill the extra memories with duplicates of .01 and .03 since they are the most active), turning on RATS causes the scanning to start. Everything appears normal, except that now, 1.5 minutes after transmitting, the 27A will resume scanning. When RATS is active, the S/S switch is disabled, since the relay shorts across the switch contacts. Turning off RATS will allow normal S/S operation.

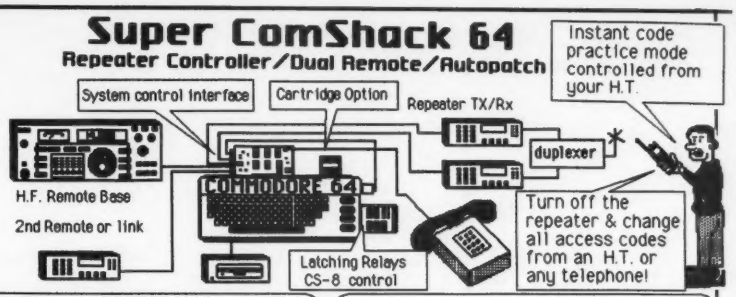
Happy Ending

Now everyone is happy. My radio continually scans its little heart out, digipeating and collecting or dispersing mail on all five frequencies. In addition, it still monitors all five frequencies for activity, preserving the MH function I like so much. The station provides service to all, without short-changing any of those needing a little help from their friendly digipeater. Now if I can only think of a way to remotely turn off all those beacons that fill up the MH log. ■

"When You Buy, Say 73"

Super ComShack 64

Repeater Controller/Dual Remote/Autopatch


Instant code practice mode controlled from your H.T.
System control interface
Cartridge Option
Repeater TX/Rx
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COMMODORE 64
H.F. Remote Base
2nd Remote or link
Latching Relays CS-8 control
Turn off the repeater & change all access codes from an H.T. or any telephone!

Super Repeater Controller

*Remotely programeable with Touchtones/ change up to 9 sets of access codes from H.T. or telephone!
*Synthesized speech consisting of high quality male or female digitized human voice
*Dual Remote base (H.F. & V.H.F.)
*Autopatch & Super Repeater Controller
*Program voice ID tail message from your H.T.
*Automatic voice clock & activity timers
*Multiple commands can be executed at once (up to 16 digits per command string)
*Sub-audible tone & speed dial compatible
*Alarm clock & auto-excute command string!
*Optional autoboot cartridge (no disk drive needed)
*Send system commands from telephone line!

Special Club Features

*Generates random code practice @ any speed with voice readback after each 20 random code group!
*Set CW speed & pitch from your H.T.
*Input up to 22 vocab words & letters as ID or mail box message @ speed dial rates from H.T.
*Enable/disable up to 50; tel. #'s + wild cards

Autopatch Specifications

*300 Touchtone loadable Autodial numbers plus 10 Emergency Autodial (quick access)
*300 Reverse patch call signs uploaded from your H.T./general or directed page modes
*Incoming caller receives voice message to enter 3 digit code to selective page a call sign (D.P. mode)
*Phone number memory readback
*Enable/disable 50 area codes + wild card #'s
*Full or half duplex (repeater on/off)
*Storage of MCI/Sprint access codes
*Call waiting allows switching to second phone line
*Touchtones are regenerated onto the tel./speed dial
*Touchtone or dial pulse modes
*Reverse patch active in all modes

Dual Remote Base Specifications

* H.F. remote supports: Yaesu FT-757/767/980 Kenwood TS-440/940, Icom IC-735
*2nd remote control data supports: Yaesu FT-727 FT-767 & Kenwood 711/811-or the-7950 or TS-2530/70 with RAP1 (control card)
*10 H.F. Memory channels/enter or recall
*Automatic USB/LSB/FM/AM mode select
*Scan up/down, fast, or 100hz steps
*Control CS-8 relay/latch /master reset /Status
*H.F./V.H.F. Monitor only or TX enable modes
*All control inputs are voice confirmed including frequency, mode, scan status, time, outputs on/off
*VHF remote, as link input, & repeater can be active

System Options

*8 Latching Relay control (CS-8) **$ 79.95**
+ 3 DPDT 2A relays, 5 open collector outputs
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+ automatic PTT fan control/master all off code
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MODEL **CS64S-$349.95** (wired and tested)

includes: computer interface, disk, cables & manual, duplex & simplex versions are supplied (some features not applicable when using simplex)
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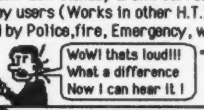
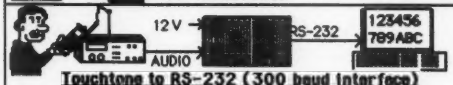
Used by Police,fire, Emergency, when it needs to be loud!

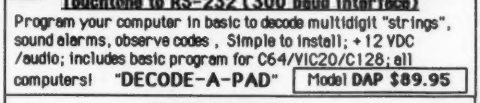


"AUDIO BLASTER"
Model **AB1-$19.95**



Touchtone to RS-232 (300 baud interface)

Program your computer in basic to decode multidigit "strings", sound alarms, observe codes, Simple to install; +12 VDC /audio; includes basic program for C64/VIC20/C128; all computers! "DECODE-A-PAD" Model **DAP $89.95**



Remote Keypad Rows & Columns Controller Plus Two 4 digit decoders (on/off)/Will control frequency of any keypad entry radio such as the Kenwood 7950/2530/IC04-AT. Easy to install in parallelly with existing keypad/Use with ComShack 64 as a freq. controller or with Pro Search rotor control box/A versatile board for all remote control applications. The latches may be used for on/off or momentary.

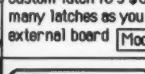
"REMOTE-A-PAD" Model **RAP-1 $149.95**

Touchtone 4 Digit Decoder & on/off latch

50,000 combinations

Repeater on/off Master control

Wired and tested +5 to +12 Volts/ User programeable to 50,000 codes/ All 16 digits/Send code once to turn on, again to turn off/ Momentary & Latching output/drives relay/LED latch indicator/Optional 4 digit extra custom latch IC's $8.95 each/add as many latches as you want to your external board Model **TSD $59.95**



Touchtone Decoder Kit

M957 Teltone 5 to12v.15ma (SSI-201 compatable)/inc. 3.58 Mhz Crystal/ 22 pin socket, Data Sheet, Sample circuits, decoder specs, all 16 touchtones, BCD/HEX.

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Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

The Fakeroo

Can this kid really copy RTTY by ear or is someone pulling the old fakeroo?

It seemed pretty clear that somebody out there was after me. But I didn't know who, and I didn't know why. And I still don't.

I decided I must be on somebody's hit list when this young kid showed up in my shack claiming to copy RTTY by ear. He had to be faking it, of course, though I haven't figured out how. And because he was a perfect stranger, it was clear that somebody else must have put him up to it, probably to get the laugh on yours truly.

The reason this is so surprising is that I'm such a nice guy, no pun intended. If I were a surly SOB or a really nasty person, I could understand somebody laying in wait for me. But I'm not. See, I never hog frequencies, laugh at lids, ridicule guys with rotten rigs, swap Novices my junk for their goodies, cheat Silent Keys' widows out of their husbands' gear, tune up on top of QSOs, or run a gallon to work local traffic.

We all know a lot of rotten amateurs who can't make such claims without crossing their fingers. And any one of them would be fair game for a gag aimed at giving him his comeuppance by making him look silly. Heck, we'd be happy to help. But none of these guys is the target of this apparent ham scam. I am.

I keep asking myself, could it be W9PBS, trying to lay one on me because I haven't been back yet to ring out all those rotor leads I promised to reconnect when I had to cut them last fall to replace the storm window in his shack that I accidently smashed with an 807? Could it maybe be W9ODM, still sore about the meter I blew in his noise bridge that never nulled worth a hoot anyway? Or could W9PLW be behind it, irked because I lost the dang operator's manual and schematic he loaned me? I just don't know.

Anyway, whoever it is, he picked a poor way to put me on. I wasn't born yesterday, you know. So I didn't fall for this kid claiming to copy RTTY in his head.

Anybody can recognize the sound patterns of CQing or RYing in Baudot or ASCII, but nobody can actually copy that high-bit, low-bit stuff, right? And if somebody comes along who seems as if he's reading RTTY solid at 60, 67, or 75 baud, then apologizes for missing a letter here and there at 100, he's got to be pulling your leg, right?

Bet the rig on it, friend. And the farm, if you own one. It's pretty nearly a sure thing you've got a fakeroo on your hands.

"I decided I must be on somebody's hit list when this young kid showed up in my shack claiming to copy RTTY by ear."

My fakeroo said his name is Carlos, Carlos Ramos. He looked to be about 16, give or take. He told me he's a junior in the local high school, and said he was boning up to try for his ham ticket. He seemed like a real bright kid and a nice one to boot, except he wouldn't admit he was pulling my leg or tell me who was behind the gag.

Carlos materialized in my basement shack one Sunday afternoon while I lounged back in my swivel chair chatting with a buddy on the local two-meter machine. I heard footsteps behind me, swung around, and there he was, just inside the doorway. He was staring over my shoulder at the radio gear, his eyes shining like overvolted LEDs.

"Hi," I said, cutting off the transceiver's audio and extending my hand to shake his. "Come on in. Pull up a chair."

"Your...uhh...lady saw me lookin' at your beam outside," the kid said, sounding embarrassed. "She invited me in and sent me downstairs here."

"Standing orders," I said. "Visitors welcomed. Name's Guy. What's yours?"

The kid told me, allowed his hand to be shaken without contributing anything to the motion, but never looked me in the face. That's because his eyes were scanning the radio equipment and the two Commodores on the operating table.

"Excuse me a minute while I hang up with my friend," I said, turning the gain back up on the two-meter rig. "You a ham?"

The kid shook his head, mumbled that he was working on it, and switched his gaze to the transceiver as audio burst from its speaker.

"...pop a fuse or get a landline or what?" the radio was asking. Then it went silent.

"Sorry," I said, keying the mike. "Neither. Company in the shack. Young visitor name of Carlos. He's gonna have a call of his own one of these days." I held the mike to the kid's face, prompted him with, "We're chatting with John across town, Carlos. Tell him hello."

The kid didn't. His face went white. He swallowed a couple of times, but didn't say anything. I recognized the symptoms of classic mike fright, remembering its terrors from a long time ago.

"Carlos says hello," I told the mike. "Listen, John, I'll let you go for now and catch you later. Have a good one. This is K9AZG shutting down. Ciao."

Switching off the radio, I swung around to face the kid, waved at the chair in front of the word-processing equipment at the far end of the operating table from the radio gear.

"Sit down, Carlos. And relax. You look uptight."

"I guess I am," the kid said, not moving. "I've never been in a...uh...ham station before. It's...uh...scary."

"Shouldn't be," I said. "This is just run-of-the-mill gear, nearly all of it commercial."

"It looks so expensive," the kid said.

"Not really," I said. "The price of a good used car buys it all. Anything here you don't recognize?"

The boy shook his head, said he'd seen the separate pieces of equipment in magazine ads, but still found the collection awesome.

Remembering my own frightening first glimpse of a ham station—W9NVH, Milwaukee, 160-meter AM, kilowatt, 1932—I knew where he was coming from.

"Here," I said, switching on the low-band transceiver and getting up from the operating chair. "Sit down. Tune around. That's a Kenwood TS-830S."

Carlos sat down. The Kenwood was on 20, lower sideband. The boy tuned in a RTTY signal on 14.086, sat there apparently enthralled by the burbling.

I reached in front of him to turn on the master switch powering the monitor and the RTTY terminal to his right, flipped on the C-64, punched "SYS32768," then "RTTY," into the keyboard. Letters started marching across the bottom of the green display, and completed lines began scrolling upwards.

The boy paid no attention to the monitor. He was staring vacantly at the transceiver's frequency-readout display in front of him. But his lips moved in apparent synchronization with the letters forming on the screen 45 degrees to his right.

"Hey," I said. "What are you doing?"

"Reading . . . uh . . . the mail," the boy said. "Isn't that what you call it?"

"Yes." I said. "That's what you call it." My voice sounded brusque, even to me. "But how can you be reading the mail?"

"Did I do something wrong?"

"That's RTTY," I said. "You're copying it in your head? Baudot by ear?"

The boy nodded.

"ASCII gives me trouble," he said apologetically. "Capital letters mess me up."

"Whoa," I said, suddenly sensing the pulling of a leg here and realizing it was mine. A strange kid stumbling into the shack, a beautiful mike-fright act, and a lad reading RTTY in his head. Wow! They almost got me.

I looked around for a hidden camera, realized none could have been planted here in my own basement without my knowledge, and tried a different tact.

"Okay, kid," I said sternly. "The act's over. Who sent you?"

The boy looked frightened.

"I told you," he said, speaking all in a rush. "I was walkin' by and I saw your beam and I stopped to look at it and your lady made me come in and . . ."

I decided to change my tactics. If I couldn't scare anything out of him bad-guy style, I'd switch to the good-guy routine that so much better fits my normally sweet nature.

"Sorry, Carlos," I said, friendly again. "I didn't mean to snap at you. You startled me. We both know you can't copy RTTY in your head. Only you were faking it so well you shook me up."

"I wasn't fakin'," Carlos said, looking confused. "I can too copy RTTY in my head. Some, anyway. I do better with pencil and paper, though, because that's how I practice for my ham-ticket exam."

"Uh huh," I said.

"They do allow paper and pencil for the Morse, RTTY, and ASCII parts of the test, don't they?" the kid asked.

I pretended not to hear him, maintained my friendly smile, and prodded, "So just between us girls, Carlos, who sent you?"

"Nobody. I told you. I was walkin' by . . ."

"Okay, okay," I said, smiling my chummy smile. "Tell you what. You move over there to that chair by the word processor and let me key in some RTTY you can copy for me."

"Not too fast, please," the boy said, moving down to the far end of the operating table. He picked up a pencil and poised it over a scratch pad. "I'm a little nervous. Anyway, I start losing some around 75 baud because I can't write fast enough."

"We're set up for 60," I said. "Here we go."

"I craned my neck to read what he had scrawled. The sly red fox routine. Verbatim. The way I sent it. Even the typing error."

I swung the monitor to face me at the operating position, knowing the boy couldn't see it from where he sat. I turned the transceiver mike gain to zero to avoid putting a signal on the air. Then I keyed into transmit mode and began punching the sly red fox routine.

The boy cocked his ear at the station speaker and started to write. I finished, craned my neck to read what he had scrawled. The sly red fox routine. Verbatim. The way I sent it. Even the typing error.

"Lucky guess," I told myself, realizing that in the past someone could have bothered to copy my red fox messages often enough to know what part of it I always mess up.

Punching up a brag-tape from disk storage, I keyed the transmitter on. The system began burbling away, automatically chronicling my age, my accomplishments, my ham history, my equipment, my family ties. I got up to look over the boy's shoulder.

His pencil was racing across the paper, getting it all down. Word for word. Perfect copy.

"Of course," I told myself. "I've sent that tape over the air a hundred times. The gagster recorded it and made the kid memorize it."

The brag-tape message ended, and the RTTY gear began sending nulls. I keyed it off and went to work on the boy again.

"You're good, Carlos," I said. "You're very good."

"Thanks," the kid said, looking pleased. "I practice a lot. I listen all the time on my Sky Buddy."

"Sky Buddy?" I said, pouncing. "Aha! Gotcha! That's an obsolete old tube radio that doesn't even have a product detector. It couldn't possibly provide decent RTTY copy."

"I know," the kid said, shaking his head sadly. "It ain't very good. I can only read RTTY on 80. It drifts too bad on the higher bands. And the bfo jumps frequency a lot."

That's when I blew it, losing my temper for the moment, something I almost never do because I'm just too nice a guy.

"Listen, kid," I said, looking around for some kind of a club to threaten him with. "Drop the act. Tell me who sent you, or I'll beat it out of you!"

The boy took off.

I could hear his shoes slapping the floor, up the stairs, down the hall. There was the distant slam of the front door and then silence.

The intercom speaker came to life.

"Everything all right?" my wife's voice asked.

"Sure," I told her, holding down the talk button on the box. "Why?"

"That boy," the voice said. "He flew by me and out the door as if he were pursued by demons."

"There aren't any demons down here," I said, feeling like one. "Just me."

"He sure acted scared."

"Acted is the key word," I said. "He was putting you on. And me, too. What a fakeroo! Claimed he can copy RTTY in his head."

There was a long pause. Then my wife asked, "Is that hard?"

"Yeah," I told her. "It's real hard. You got a high-school directory up there?"

"Teacher or student?"

"Student. I need a home address for that kid. Junior class. Name's Carlos Ramos."

"Why?" the voice asked. "You want to scare him some more?"

"No. Like I said, there aren't any demons down here," I told her, still feeling like one. "I want to send him a present."

"What kind of present?" the intercom asked.

"A decent ham-band receiver. Second- or thirdhand. Whatever I can pick up for a few dollars. And a license manual."

"Why?" the voice demanded.

"The receiver because every kid deserves something better than a worn-out Sky Buddy. And the manual to show this particular kid that RTTY and ASCII aren't part of the license exam."

"He thinks they are?" my asked asked.

"I'm not sure," I told her. "A real fakeroo would know better. Carlos . . . maybe not." ■

John LaMartina K3NXU
RD1 Box 1882
New Freedom PA 17349

Semi-Rapid HT Charging

This is the 8-hour option ICOM didn't tell you about—and no soldering is required.

If you own an ICOM hand-held, you are aware that the battery supplied, as well as those available as options, allows for only two types of charging capability. The normal charge rate requires 15 hours, while the rapid rate gets the job done in one to two hours. Until now, there was no compromise. If you use your HT from morning to evening, with only eight hours of charge time available at night, try the Semi-Rapid Charge alternative.

What this requires is the BC-30 or BC-35 charger and ICOM's least expensive battery option, the BP-4 alkaline-battery case. The BP-4 case holds six AA battery cells and is compatible with both series of ICOM hand-helds.

The semi-rapid charge option requires no physical modification to the charger itself, but rather to the battery case. There's no need to plug in the soldering iron.

NiCd Battery Selection

The NiCds needed are readily available off the shelf (Radio Shack 23-125 rechargeable Enercell). Be sure, however, that you acquire cells that meet rapid-charge requirements. Standard NiCds will show a charge rate of approximately 45 mA for 14 hours. NiCds capable of rapid charging will also show an additional fast-charge rate—i.e., 150 mA for four hours. This should be plainly printed on the cell's jacket. What this is saying is that this NiCd will accept a maximum charging current of 150 mA. Warning: Never exceed the maximum recommended current for charging. This will cause the NiCd to overheat and become severely damaged.

The Charge Rate

The current required to charge a NiCd is relatively easy to compute. The total amount of charge current required is approximately one-third more than its total current capacity. For example, a NiCd with a capacity of 450 mA will require a total of 600 mA of charge over a given period of time. With the battery charging at 45 mA, the time would be about 14 hours (45 x 14 = 630). Charging at 150 mA would require only four hours (150 x 4 = 600). For this project, the rate that we are concerned with is 70 mA for 8-1/2 hours.

"The semi-rapid charge option requires no physical modification to the charger itself, but rather to the battery case."

The BC-30 and BC-35 Chargers

There are three available charge rates when you are using the ICOM charger: 25, 45, and 600 mA. The selection of the proper charge rate is determined by the notched key on the bottom of the battery pack. The BP-4 is set up to automatically select the 45-mA charge rate.

By design of the BC-30/35, if both the 25- and 45-mA switches are selected simultaneously, the charge rate becomes 70 mA. Now the pieces should all be fitting together.

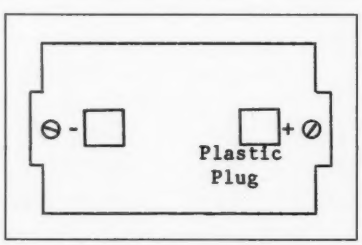


Fig. 1. The bottom of the BP-4 battery pack.

The Actual Modification

On the bottom of the BP-4 battery pack, you will notice that there are two squares notched into the plastic case (Fig. 1). You will also note that each of the screw terminals is marked, one positive, the other negative.

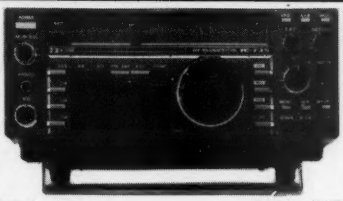
Cut a small piece of plastic about 1/16-inch thick to fit into the square on the positive side of the case. One drop of glue is all that will be necessary to complete the modification. If you have the older style BP-4 battery case, which splits in half, separate the two sections before gluing to avoid permanently bonding the two sides together.

After the piece of plastic is glued into place, trim the plastic to be smooth and level with the bottom of the case. This is necessary to ensure that both switches are depressed when the battery is inserted into the charger.

Conclusion

This modification lets you enter into the world of the semi-rapid charged NiCd. What you now have is a battery pack that should last through an entire day's use (450 mA) and one that will charge to maximum while you sleep. My XYL, Linda WB3EBD, no longer worries about the HT dying after dinner due to an undercharged NiCd.

Note: To prevent damage to your battery, be sure to remove the NiCd from the charger after eight hours. Remember, there is no over-charge protection on the BP-4. ■



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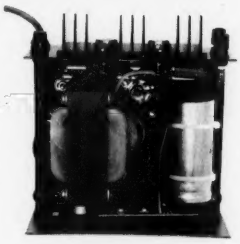

INSIDE VIEW – RS-12A

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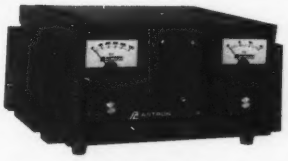

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RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

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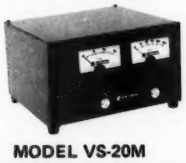
MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
• Switchable Volt and Amp Meter				
RS-12M	9	12	4½ x 8 x 9	13
• Separate Volt and Amp Meters				
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES



MODEL VS-20M

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- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

William Bruce Cameron WA4UZM
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Revive A Dying Swan

Haul up your boat-anchor Swan 250 and give it new life with a home-brew vxo.

With six meters occasionally active and the dollar-to-yen ratio making Japanese radios more expensive, some hams are looking at old U.S. gear and wondering. The Swan 250 (a.k.a. the Swan too-drifty) is cheap but has not improved with age. At some hamfests, the seller may include a rope to tie it to your boat.

It is not a bad design, except for the vfo, which was conceived with incredible optimism. Have you ever built a vfo on 13.1 MHz that multiplied to 39.3 and was stable enough for SSB? Not bloody likely, as our Aussie chums might say. Well, I looked on it as a challenge, and now and then I win one.

The Vxo

Although it is terribly difficult to build a vfo for these frequencies, it is easy to build a vxo. Vxo? In the 1930s, we called it a rubber crystal. It is a combination oscillator with some of the stability of a crystal and some of the flexibility of a self-excited oscillator. (Master oscillator, ECO, vfo, or whatever they called it in your day.)

There are several designs that work, but the one I prefer is derived from the Colpitts oscillator. That is the one that uses capacitors to divide the rf for feedback. It is what you usually find in a grid-dip oscillator that uses two-pin (untapped) coils. If you plug in a crystal in place of the coil, it becomes a Pierce oscillator, and you can vary the frequency a bit with the tuning capacitor. If you put a coil in series with the crystal, you can move the frequency more.

There is a maximum capacity you can shunt across the crystal before it stops oscillating. A 150–150 split stator will give you more than you need. Output drops as you increase capacity. The range depends mostly on the coil, but if you use too large a coil, you get just another unstable oscillator. I wound 30 turns of #28 enameled wire on a 3/8″ slug-tuned ceramic form.

Each crystal can be pulled 5 to 8 kHz and thus will cover 30 to 50 kHz at the signal frequency. If you want a wide range, you will have to invest in a number of crystals. I built my vxo out of the junk box, but as I have played with radios since 1932, my junk box may be older and larger than yours. If you have friends as old as I, they likely have suitable crystals lying around. If not, try Jan Crystals (PO Box 06017, Fort Myers FL 33906; 813-936-2397). They have thousands of them and would be delighted to sell you a few. Exact frequencies are not required.

Circuit Design

The circuit in Fig. 1 is almost self-explanatory. You could build it with transistors if you preferred, but the Swan is tube gear, so the voltages are already available. The tube can be any hot pentode. A 12AU6 is a good choice, but I used a 6BH6 with a #47 bulb in series with the filament. Use what you have handy.

A 12-position switch will allow for lots of crystals. I used a National Velvet vernier dial for the capacitor, and the 5:1 ratio makes for very easy tuning.

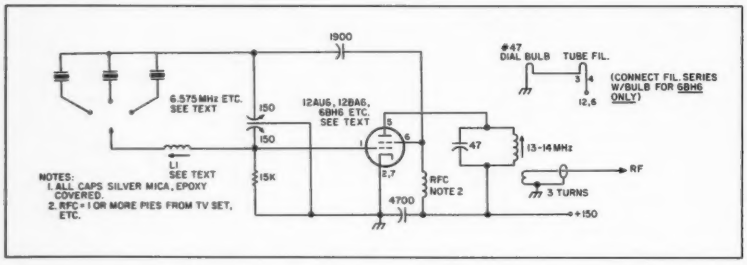

Fig. 1. The vxo circuit.

There is no need to try to cram all this stuff into the original vfo box on the Swan. Besides, if you did, you might spoil its resale value! I built it on a 5″ x 9″ x 3″ chassis with everything underneath except the tube. The crystals were two kinds: some HC6Us and some old CR1As left over from World War II. I taped them together, with cardboard spacers between the HC6Us (which are not flat), and then clamped the whole bundle to the chassis with a strip of aluminum flashing. Sockets are a needless luxury in a project like this. Solder hook-up wire to the pins.

A three-wire power cord and a matching length of small coax (such as RG-174/U) connects to the rear of the Swan with an octal plug. There is already a hole marked "accessory" that is punched for the socket. The coax continues to the 6EW6 tripler, and the outboard rf generator replaces the internal vfo and its amplifiers.

Lift one end of C1809 (430 pF) from the transistor buffer and attach it to a tie strip added to the chassis. Connect the center of the coax to this and ground the braid. Pick up regulated 150 plus from the left end of the 6k-Ohm register, which may be marked #458 or R1606. (The other end is tied to #427, 400 Ohms.) Get the 12.6 V ac for the filament from pin 3 of the marker oscillator if your rig has one, or from the nearest other source. Change R101 from 47k to 100k for more drive.

The Swan 250 has an i-f of 10.7 MHz and uses low-side oscillator injection. To estimate the highest frequency a given crystal will tune, multiply the series-resonant frequency of the crystal by six and add 10.7 MHz. Thus, a 6.575 crystal will tune from approximately 50.150 down to about 50.110, depending in part on the gain of the circuit and the activity of the crystal. Some of this must be determined empirically, which is a fancy way of saying "cut and try."

Even if you have no interest in this particular rig, keep the vxo approach in mind. I have used it successfully on several pieces of gear as far removed as two meters and 160. ■

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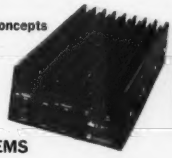

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• SUPERSCAF •

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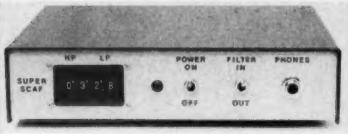

SuperSCAF is an innovative, high performance audio filter. SuperSCAF incorporates state-of-the-art switched capacitor filter technology to achieve unprecedented receiver selectivity and unwanted signal and noise rejection. Upper and lower passband cutoff frequencies are digitally programmed via front-panel thumbwheel switches at increments of approximately 100Hz between 200 and 3900 Hz..

SuperSCAF is an easy to assemble kit which can be completed in 1 or 2 evenings. The kit features a single PC board and minimal point-to-point wiring.

No adjustments or test equipment are required!

• PRODUCT INFORMATION •

Bandwidth	50 to 3700 Hz.
Stopband Attenuation	Greater than 51 dB
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Filter Type	14th Order Elliptical
Passband Ripple	Less than 0.2 dB
Audio Power Output	1.5 Watts
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25 – 550 MHz

800 – 1300 MHz

Specifications:

Receiving mode – Narrow band FM, Wide band FM & AM

Receiver circuit – Microprocessor controlled PLL Frequency synthesized superheterodyne type with high-level doubled balanced mixer

Receiver IF – 750MHz, 45.03MHz, 5.5 MHz (WFM) and 455kHz (NFM & AM)

Sensitivity – NFM – 0.35 uV (12dB SINAD)
WFM – 1.00 uV (12dB SINAD)
AM – 1.00 uV (10dB S/N)

Selectivity – NFM – ±7.5kHz @ 6dB
±20kHz @ 70dB
WFM – ±50kHz @ 6dB
±250kHz @ 60dB
AM – ±5.0kHz @ 6dB
±10kHz @ 70dB

Number of memory channel – 20 channels
Scan rate – 5 channels per second
Search rate – 6 seconds per MHz
Antenna connector – Standard BNC type, 50-ohm
Audio output power – 1 watt at less than 10% THD
Power requirement – 12 to 14Vdc at 300 to 500ma
Size and weight – 5.4"W x 3.15"H x 7.88"D, 2.6 lbs

Options:

Coupled mobile mounting bracket
Trunk lid mobile antenna with 12 ft cable
Discone base antenna with 30 ft cable
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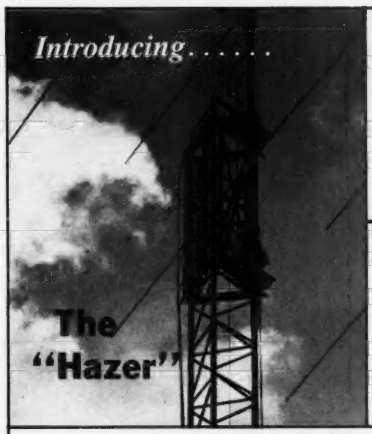

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Are you uncomfortable with heights? Has your doctor advised you not to climb? Do you want to be able to install or maintain your beam in several hours instead of several days?

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Answer: **Guy wires can be mounted on the HAZER or at the very top of the tower. One set of guy wires is usually all you'll need on towers up to 60'. On really tall towers the center guys must be disconnected while lowering the HAZER.**

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-12

NEVER SAY DIE

from page 11

them—particularly in Taiwan and Hong Kong.

6) Remember, the dollar is still powerful in Taiwan, Korea and Hong Kong, so the shopping is outstanding. Hong Kong is where you buy cameras and electronic gadgets.

7) I plan on being along. I've been there a dozen times, so I know the ropes. This can help if it's your first trip to Asia.

8) Despite the appreciation of the yen, Commerce Tours has been able to hold the price down to a semi-measly $3130 for the tour. Yes, you can custom design the tour if you want—say, skipping Osaka or Hong Kong. This is one of the best travel bargains I've seen—which is why cheap. . . er, thrifty me loves it. It's great to go to first-class hotels and pay so little.

Now look here, we want no cheating on trademark and publishing royalties, so you have to promise not to stock up on Taiwan Rolexes and book knock-offs. I can't imagine why anyone would ever buy a $25 imitation Rolex, even if it keeps better time than the real thing and could fool a jeweler. Disgusting. Only people with very weak characters, or show-offs, would buy such things and smuggle them into the U.S. Tsk.

9) The tour usually attracts from 150–250 electronics-oriented men and their wives. Most are from the U.S., but we've had groups from Europe and Australia join us. Great bunch of people—you'll make some good contacts. There are usually a dozen or so hams on the tour—and, if you want, you can bring an HT and get a license in Hong Kong.

10) As long as you're already in Asia, why not extend your trip a few days? We can arrange a two-day extention to the Canton Trade Fair in China—and yes, they sell things there. For instance, you won't believe carpet prices—bring your room measurements and have the carpet shipped home. You might even be able to pay for your trip. Or perhaps Beijing for three days so you can climb the Great Wall. There's an electronics show in Singapore—how about a couple days there? Hey, you only have one lifetime, so don't let a minor thing like work stop you from taking a few more days and storing up memories.

The tour runs two weeks, starting October 3rd from the U.S. and returning from Hong Kong the 18th. Don't forget, you gain a day coming back.

If you're interested, check out the ad on the facing page and send in the coupon or call my 800 number so I can have Commerce Tours send you a brochure. Who knows, you might grab me at breakfast one morning and get me to come up with some new ideas for your business.■

SPECIAL EVENTS

RUN FOR THE ROSES
MAY 1–2

The Louisville, Kentucky, ARTS will operate the "Run for the Roses" under the call W4CN from 2400 to 0500 UTC on May 1 and from 1300 to 1700 UTC on May 2. Suggested frequencies 21.125 Novice, 21.325–14.250 SSB. For a commemorative certificate, send a QSL and an SASE via ARTS Club W4CN, PO Box 7391, Louisville KY 40207. No. 10 envelope for folder or 9 x 12 for unfolded (39¢ postage).

FRESNO CA
MAY 1–3

The Fresno ARC will hold its 45th annual Hamfest at the Fresno Airport Holiday Inn on May 1–3. There will be demonstrations and forums, and FCC exams will be given. Talk-in on 146.34/.94. For additional information, contact Glen T. Caine, Fresno ARC, PO Box 783, Fresno CA 93712; (209)-292-4611.

SIERRA VISTA AZ
MAY 1–3

The Cochise ARA will hold its 1987 hamfest on May 1–3 at the club's training facility on South Moson Road (which intersects Rte. 90, five miles east of the 90/92 junction in Sierra Vista, Arizona). No charge for tailgaters. Talk-in on 146.52 or 146.16/.76. For more information, call Don Morgan W7ACI at (602)-458-5293, or write CARA, PO Box 1855, Sierra Vista AZ 86636.

CEDARBURG WI
MAY 2

The Ozaukee Radio Club, Inc., will sponsor its 8th annual Cedarburg Swapfest on May 2, from 8 a.m. to 1 p.m., at the Circle B Recreation Center, Highway 60 and County I, Cedarburg, Wisconsin (20 miles north of Milwaukee). Admission is $2 in advance, $3 at the door. Four-foot tables are $3 each. For admission tickets, table reservations, maps, or more information, send a business-sized SASE to 1987 ORC Swapfest, 101 E. Clay Street, Saukville WI 53080, or call (414)-284-3271.

BEMIDJI MN
MAY 2

The Bemidji ARC will hold its annual hamfest on May 2 at the Bemidji Middle School, beginning at 8 a.m. Exams will be given. Talk-in on 146.13/.73. For more information, contact Bemidji ARC, PO Box 524, Bemidji MN 56601; (218)-751-7920.

ROGERS AR
MAY 2

The Northwest Arkansas ARC will hold its 7th annual Hamfest on May 2, from 8 a.m. to 4 p.m., in the Rogers Youth Center, 315 West Olive Street, Rogers, Arkansas. Tables are available at no charge to commercial exhibitors or $2 each for others—first come, first served. Talk-in on .16/.76 or .03/.63. For more information, contact Roy Milliren AF5W, 2014 S. 16th Street, Rogers AR 72756; (501)-636-6750.

GREENVILLE SC
MAY 2–3

The Blue Ridge ARS will sponsor its 48th annual Greenville Hamfest and Electronics Flea Market on May 2 and 3 at the American Legion Fairgrounds in Greenville, South Carolina. Hours on Saturday are from 8 a.m. to 5 p.m., on Sunday from 8 a.m. to 3 p.m. Admission is $3.50 in advance and $5 at the gate. Walk-in amateur radio license exams given. For advance tickets or additional information, please send an SASE to Blue Ridge ARS, PO Box 6751, Greenville SC 29606.

IEEE TWO-WAY POLICE RADIO MILESTONE
MAY 2–3

The Bayonne, New Jersey, OEM ARC will operate W2ODV on May 2 and 3 from 1400–2100 UTC to commemorate the recognition of a national electrical engineering milestone by the IEEE for the first two-way police radio system. It was installed by the Bayonne, New Jersey, police department in 1933. Suggested frequencies: 3.870, 7.270, 14.270, 146.520, 144.830/145.430, and 222.680/224.280. For a certificate, send a QSL and a 39¢ SASE to W2ODV, Bayonne OEM ARC, 16th St. Firehouse, Bayonne NJ 07002. For further information, call Jerry Shiviskis N2EJQ at (201)-997-1151 or (201)-795-4543.

BATON ROUGE LA
MAY 2–3

The Baton Rouge ARC "Hamfest 50" and La. State Convention will be held on May 2 and 3 in the Gym Armory on the campus of Louisiana State University, Baton Rouge, Louisiana. Hours—Saturday, 8 a.m. to 3 p.m.; Sunday, 8 a.m. to 2 p.m. Free admission. VE exams to Extra both days at 9 a.m. Send SASE, 610, check for $4 payable to ARRL/VEC to George Perry W5LVX, 17424 Lady Constance, Greenwell Springs LA 70739. Talk-in on 146.19/.79. For more information, send an SASE to Rick Pourciau NV5A, 879 Castle Kirk Drive, Baton Rouge LA 70808.

DREXEL HILL PA
MAY 3

The Delaware County ARA will sponsor its 8th annual Hamfest on May 3 at the Drexel Hill Middle School, State Road and Penn Avenue, Drexel Hill, Pennsylvania (5 miles SW of Philadelphia). Doors open at 8 a.m. Admission $3. Indoor tables with electricity available by reservation at $3 per space. Outdoor tailgating on a first-come, first-served basis. Novice through Extra exams begin at 10 a.m. Talk-in on 147.96/.36, 224.5, and 146.52. For advanced registration and information, write to Hamfest, DCARA, PO Box 236, Springfield PA 19064, or call Barbara N3DLG at (215)-535-1616.

SULLIVAN IL
MAY 3

The Moultrie Amateur Radio Klub (MARK) hamfest will be held (new location-old location) at the Moultrie County 4-H Fairgrounds, Cadwell Road, five miles east of Sullivan, from 8 a.m. to 3 p.m. on May 3. No charge to vendors. Space on a first-come, first-served basis. Talk-in on .055/.655 and .52. Tests will be given for amateur licenses. For more information, write to MARK, PO Box 79, Sullivan IL 61951, or call Vernon E. Jack K9SWY at (217)-728-7596.

LONG ISLAND NY
MAY 3

The Suffolk County Radio Club Indoor-Outdoor Electronics Flea Market will be held on May 3 from 8 a.m. to 2 p.m. at Republic Lodge No. 1987, 585 Broadhollow Road (Rte. 110), Melville, Long Island, New York. General admission is $3 (wives and children under 12 free). Indoor tables are $10 each, and outdoor space is $7, including one free admission. Talk-in on 144.61/145.21 and 146.52. For additional information, call Bill Sullivan N2ETG at (516)-689-9871 in the evenings.

LYNCHBURG VA
MAY 3

The Lynchburg ARC, Inc., will hold its annual Swapfest on May 3, beginning at 9 a.m., on the grounds of Brookville High School, just outside of Lynchburg, Virginia, on Rte. 460 West. Admission is $1; tailgaters pay general admission, plus $2. Exams begin at 1 p.m., with limited walk-ins. Pre-register by sending a completed Form 610, copy of license, and check payable to ARRL/VEC to LARC Volunteer Exams, PO Box 201, Lynchburg VA 24502. More information can be obtained about the Swapfest by writing to the club at PO Box 4242, Lynchburg VA 24502.

STIRLING NJ
MAY 3

The Tri-County Radio Association will sponsor its annual Indoor Hamfest/Flea Market on May 3, from 9 a.m. to 3 p.m., in the Passaic Township Community Center in Stirling, New Jersey. Donations $3. Tables $8, with power $10. Limited reserved tailgating. Talk-in on 147.855/.255, 146.25, and 444.975/449.975. For more information, call Dick Franklin W2EUF at (201)-232-5955 or write PO Box 182, Westfield NJ 07090.

SANDWICH IL
MAY 3

The Kishwaukee ARC will sponsor the DeKalb Hamfest on May 3 at the Sandwich Fairgrounds on Suydam Road, just north of Rte. 34. Donation $2 in advance, $3 at the gate. Inside tables $5 each, outside selling space free. Talk-in on 146.52, 444.45, 146.13/.73. For tickets, write to KARC, Box 264, Sycamore IL 60178.

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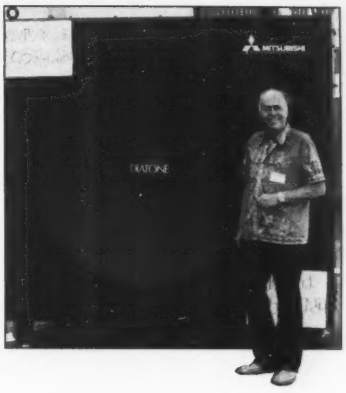

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In addition to business, you will enjoy the surprisingly low cost Asian shopping. Few return from these tours (which we've been organizing for over 10 years) without a custom-made suit or two, a miniature cassette or CD player and a stack of Compact Discs, most of which are unavailable in the US.

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DEERFIELD NH
MAY 9

The Hosstraders (Joe K1RQG, Bob W1GWU, and Norman WA1IVB) will hold their Spring Tailgate Swapfest on May 9 at the Deerfield, New Hampshire, Fairgrounds. Admission is $2 per person, including sellers and commercial dealers. Profits benefit Shriners' Burns Hospital. Talk-in on 146.40/147.00. For a map or info, send an SASE to WA1IVB, RFD Box 57, West Baldwin ME 04091.

FLEMINGTON NJ
MAY 9

The Cherryville Repeater Association will hold its annual hamfest on May 9, from 8 a.m. to 4 p.m., at Hunterdon Central High School, Flemington, New Jersey. 200 indoor tables plus tailgating. FCC exams given. Talk-in on 146.52, 147.975/.375. For further information or reservations, call Bill Inkrote K2NJ at (201)-788-4080 or Don Mazak NR2H at (201)-782-1114.

FORT SHERIDAN 100TH
MAY 9

On May 9 from 0900 to 1600 local CDT (1400–2100 UTC), the Lake County, Illinois, Radio Amateur Civil Emergency Service (RACES), in cooperation with Troop #273 of the Northeast Illinois Council of the Boy Scouts of America, will be celebrating the U.S. Army's Fort Sheridan Centennial (1887–1987). Continuous operation will be in the low end of the 20m General phone band, on-the-hour operation in the new Novice/Tech. 10m phone band, and locally on 2m 146.550 phone and 145.010 packet. The callsign for the special-event station will be W9FUL. For a commemorative certificate, send QSL and 9 x 12 SASE (39¢) to the Lake County RACES, Inc., PO Box 624, Mundelein IL 60060. Deadline for certificates is July 4.

DANVILLE IL
MAY 9

The Vermilion County ARA, Inc., of Danville, Illinois, will hold an auction on May 9 at the Tilton 579 Civic Center, from 10 a.m. until 2 p.m. Free admission. Charge for auctioned items is 10% of $100 or less. Any items over $100, $10 flat fee. No charge if item is not sold. For further information, please contact Rod Pruitt WD9HXG or Clint Hartley N9EVT on the 146.22/.82 repeater in Danville, Illinois.

DULUTH MN
MAY 9

The Arrowhead ARC of the Duluth/Superior area will present Swapfest '87 on May 9, from 10 a.m. to 3 p.m., at the First United Methodist Church (the copper-domed church), located at 230 East Skyline Parkway in Duluth, Minnesota. Admission will be $4, with 4-foot tables going for $5. Amateur license exams will be held at 9 a.m. For more information, please contact Ron Carlson KØBR, 5128 Wyoming Street, Duluth MN 55804; (218)-525-6860. The contact person for the amateur exams is Eddy Lonnstrom N9DHG, 2026 Baxter Avenue, Superior WI 54880; (715)-392-2415.

HINDENBURG 50TH
MAY 9–10

The Jersey Shore ARS will operate W2DOR in Lakehurst, New Jersey, from 1700 UTC on May 9 to 1800 UTC on May 10, to commemorate the 50th anniversary of the crash of the airship Hindenburg. Frequencies will be around 3.875, 7.275, 14.375, 21.425, and 28.525 phone and 3.706 CW. A commemorative certificate will be available to U.S. stations for $1 and to DX stations for 3 IRCs. QSL to JSARS, PO Box 295, Toms River NJ 08754.

FREQ (kHz)	EMISSION	STATION	FREQ (kHz)	EMISSION	STATION
4001.5	LSB	NPG	10259.5	CW	NPG
4010.0	CW	NPG	13927.5	RTTY	NPG
4015.0	CW	NMH	13975.5	CW	NPG
4018.5	LSB	WAR	13986.5	RTTY	AIR
4021.5	LSB	AAE	13992.5	RTTY/CW	WAR
4025.0	LSB	AIR	13997.5	CW	AIR
6970.0	CW	NPG	14375.0	USB	NPG
6995.5	CW	AIR	14385.0	USB	NPL
6997.5	CW	WAR	14389.5	USB	NAV
7301.5	LSB	NPG	14400.0	Varied	NAM
7306.5	RTTY	AIR	14403.5	USB	WAR
7309.5	LSB	AAE	14408.0	USB	AIR
7315.0	LSB	AIR	14440.0	RTTY	NMH
7346.5	LSB	NMH	14480.0	USB	NZJ
7365.0	CW	NPG	20937.5	USB	NMH
7372.5	RTTY	NAV	20992.5	USB	AAE
7375.0	RTTY	NZJ	20994.5	USB	WAR
7382.5	RTTY	NPL	20998.5	CW	NPG
7393.0	Varied	NMN	21460.0	USB	NPG
9990.0	RTTY/CW	AAE			

Table 1. Frequencies on which the military stations will operate on Armed Forces Day.

BBQ FESTIVAL
MAY 9–10

The Owensboro ARC will operate K4HY from 0000 UTC on May 9 to 0530 UTC on May 10 to celebrate its International BBQ Festival. Frequencies: 7.245 phone and 10 meters phone. Certificate for SASE via N4EKG, 1615 East 23rd Street, Owensboro KY 42303.

MEDINA OH
MAY 10

The Medina 2 Meter Group, Inc., will sponsor the Medina County Hamfest on May 10, from 8 a.m. to 2 p.m., at the Medina County Community Center, 735 Lafayette Road, Medina, Ohio. Donations, $4 at the door, $3 in advance. Vendors' tables, $6 donation. Outdoor flea market: 10-foot space, $4 donation. Talk-in on 147.63/.03. For more information, send an SASE to Medina Hamfest Committee, PO Box 452, Medina OH 44258, or call (216)-769-3033 or (216)-725-4492 between 10 a.m. and 5 p.m.

BETHLEHEM CT 200TH
MAY 10+

The Hen House Gang ARC will celebrate the 200th birthday of Bethlehem, Connecticut, from May 10 on. Operation will take place on 10, 15, 20, and 40 meters and on Novice CW. Send one postage stamp only, no envelopes. For more information, contact W1FHP, the club president.

PRODUCTS INDUSTRIAL EXPO
MAY 14–16

The Tri-City ARC will operate special-event station W7VPA on May 14–16 from Pasco, Washington, in conjunction with Products Industrial Exposition '87. Daily operation from 1800–0200 UTC will be on 20- and 80-meter General phone bands. For a certificate, send QSL and SASE to TCARC, PO Box 73, Richland WA 99352.

BROKEN ARROW OK
MAY 15–17

The Broken Arrow and Tulsa ARCs will sponsor the 1987 Green Country Hamfest on May 15–17 at the Vo-Tech Southeast Campus, 4600 S. Olive, Broken Arrow, Oklahoma (111th St. S. and 129th E. Ave.). Entertainment Friday from 6–10 p.m. Flea market and dealer exhibits open from 9–5 on Saturday and from 9–1 on Sunday. Pre-registration is $4 each, maximum of $12 per household, or $5 each at the door. Flea market tables are $5 in advance or $7.50 at the door. For more information, call Ron Gamel N5WX at (918)-663-0385, or write Green Country Hamfest, PO Box 4970, Tulsa OK 74159.

NASHUA NH
MAY 15–17

The Northeast VHF Association will sponsor the 13th annual Eastern VHF/UHF Conference on May 15–17 at Rivier College, in Nashua, New Hampshire. To pre-register, send $14 to David Knight KA1DT, 15 Oakdale Avenue, Nashua NH 03062 before May 4. Registration at the door is $20. A special registration rate of $10 is available for any first-time attendee. In recognition of the new VHF/UHF privileges for Novice-class licensees, a special feature of this year's conference is half-price registration ($7) for Novices. Make all checks payable to Eastern VHF/UHF Conference. For more information, contact Lewis D. Collins W1GXT, Publicity Chairman, Eastern VHF/UHF/SHF Conference, 10 Marshall Terrace, Wayland MA 01778; (617)-358-2854 (6 to 10 p.m. EST).

ROCHESTER NY
MAY 15–17

The Rochester ARA will sponsor the Rochester Hamfest and Computer Show on May 15–17 at the Monroe County Fairgrounds, corner of East Henrietta Road (Rte. 15A) and Calkins Road, Rochester, New York. Show hours: Friday, outdoor flea market—12 noon; Saturday, indoor flea market—7 a.m. to 5:30 p.m., exhibit hall open—8:30 a.m. to 5:30 p.m.; Sunday, indoor flea market—7 a.m. to 2 p.m., exhibit hall open—9 a.m. to 1:30 p.m. Registration: $6 in advance, $7 at the gate, children under 12 admitted free. Outdoor flea market space, $5 plus registration. Indoor flea market table, $16 each in advance only, plus registration. Make checks payable to Rochester Hamfest and send to Rochester Hamfest—Tickets, 174 Croydon Road, Rochester NY 14610. Amateur exams on Saturday. Pre-registration is required and must be submitted no later than May 8. Send business-sized SASE to A. G. deBlieck KW2X, 59 Bay Knoll Road, Rochester NY 14622. Pay $4.35 on the day of the exam. Talk-in on 146.28/.88. For more information, contact Rochester ARA, Rochester Hamfest, 300 White Spruce Boulevard, Rochester NY 14623; (716)-424-7184.

WOONSOCKET RI
MAY 16

The RI Amateur FM Repeater Service, Inc., will hold its annual Spring Flea Market and Auction on May 16, from 12 noon to 5 p.m., at the American Legion Fairmount Post 85, 870 River Street, Woonsocket, Rhode Island. Admission is free. Spaces are $5 each. Talk-in on .34/.94 and .52. For further information, contact Rick Fairweather K1KYI, Box 591, Harrisville RI 02830; (401)-568-0566 from 7–9 p.m.

MICHIGAN'S 150TH
MAY 16

The St. Joseph County ARPSA will operate special-event stations on May 16 from 1200–2400 UTC from Centreville, Michigan, to celebrate Michigan's Sesquicentennial Birthday and to kick off Michigan Week. Members' stations and callsigns will be used. Frequencies: 3.930, 7.230, 14.250, 21.350, and 28.550. To receive a certificate, please send QSL and SASE to Lynn Norris KB8AET, 535 E. Main Street, Burr Oak MI 49030.

CADILLAC MI
MAY 16

The Wexaukee ARA will hold its 27th annual Swap and Shop on May 16, from 9 a.m. to 2 p.m., at the Wexford Civic Arena, at the junction of U.S. 131 and 13th St. Admission is $3. Talk-in on 146.97. For table reservations and more information, call John Craddock KX8Z at (616)-797-5491, or write the Wexaukee ARA, PO Box 163, Cadillac MI 49601.

GODFREY IL
MAY 16

The Lewis & Clark RC will sponsor its first annual Hamfest on May 16 at the Lewis & Clark Community College campus, Highway 67-111 in Godfrey, Illinois. No admission fee. Testing for all classes at 1 p.m. Talk-in on 145.230. For more information, call Harold KC9GL at (618)-466-1909, or write Lewis & Clark Radio Club, PO Box 553, Godfrey IL 62035.

COLORADO SPRINGS CO
MAY 16

The Pikes Peak Radio Amateur Association will hold its 1987 Swapfest on May 16, from 8:30 a.m. to 4 p.m., at the Rustic Hills Mall at Palmer Park and Academy Blvd. in Colorado Springs, Colorado. Admission is free. Table rental is $8 in advance or $10 at the door. VE testing on site. Talk-in on 146.37/.97. For information or reservations, call Al NØMW at (303)-473-1660, or write PPRAA Swapfest, PO Box 16521, Colorado Springs CO 80935.

ARMED FORCES DAY TEST
MAY 16–17

The 38th annual Armed Forces Day Communication Test will be conducted from 1300 UTC on May 16 to 0245 UTC on May 17. The traditional military-to-amateur crossband operation and broadcast of the Secretary of Defense message are the featured highlights and include operations in CW, SSB, and RTTY. Special commemorative QSLs will be awarded to verified contacts with any of the participating military radio stations. SWLs who receive and accurately copy the Armed Forces Day CW and/or RTTY message will receive a special commemorative certificate.

Participating Military Stations: AIR, 2045th Info. Systems Group, Andrews AFB, Washington DC; NAV, HQ Navy-Marine Corps, MARS Radio Station, Cheltenham MD; NPL, Naval Comm. Sta., San Diego CA; AAE, HF/MARS Radio Facility, Fort Sam Houston TX; NMH, Coast Guard Radio Sta., Alexandria VA; NZJ, Marine Corps Air Sta., El Toro CA; NMN, Coast Guard Comm. Sta., Portsmouth VA; WAR, HQ Army MARS Radio Sta., Fort Meade MD; NAM, Naval Comm. Area, Master Station LANT, Norfolk VA; NPG, Naval Comm. Sta., Stockton CA.

Military stations will transmit on the frequencies listed in Table 1 and will announce the specific amateur band frequency being monitored.

Receiving Test: A 10-minute tuning call will precede each transmission. The CW broadcast will be transmitted at 25 wpm beginning at 0300 UTC on May 17. The RTTY broadcast will begin at 0345 UTC on May 17

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ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

BAND	WIRED	KIT
6M,2M, 220	$880	$630
UHF	$980	$730

(Also available for commercial bands!)

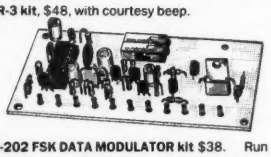
FEATURES:

- **SENSITIVITY SECOND TO NONE!** 0.15uV Typ.
- **SELECTIVITY THAT CAN'T BE BEAT!** Both 8 pole xtal filter & ceramic filter for >100dB at ±12kHz. Helical resonator front end to combat desense & intermod.
- **Flutter-proof squelch,** Automatic frequency control, separate spkr amplifier.
- **CLEAN, EASY-TUNE TRANSMITTER,** up to 20W output. 50W with additional PA.

ACCESSORIES

- **TD-2 DTMF DECODER/CONTROLLER kit only $78. Full 16 digits, 5 functions, toll call restrictor, programmable. Much more. Great for selective calling too!**
- **AP-1 AUTOPATCH** kit only **$78. Reverse patch & phone line remote control std.**
- **AP-2 Simplex Autopatch.** Use with above.

- **CWID kit,** new low price $48. Field programmable, timers, the works!
- **COR-2 kit,** $38. Audio mixer, local spkr amplifier, tail & time-out timers.
- **COR-3 kit,** $48, with courtesy beep.



- **MO-202 FSK DATA MODULATOR kit** $38. Run up to 1200 baud digital or packet radio signals through any FM transmitter.
- **DE-202 FSK DATA DEMODULATOR kit** $38.

GaAs FET PREAMPS at a fraction of the cost of comparable units!

LNG -(*) GaAs FET PREAMP

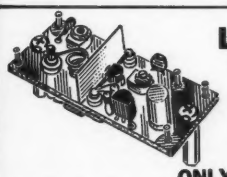
ONLY **$49!** WIRED/TESTED

FEATURES:

- **Very Low Noise:** 0.7dB VHF, 0.8dB UHF
- **High Gain:** 13-20dB, depending on freq
- **Wide Dynamic Range:** to resist overload
- **Stable:** new-type dual-gate GaAs FET

* Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.

LNW -(*) MINIATURE GaAs FET PREAMP



Unbelievably Low Price - - -

ONLY **$19**/kit, **$34** Wired/tested

GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

* Specify tuning range desired: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.

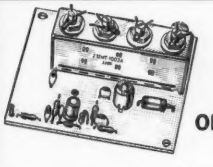
LNS-(*) IN-LINE PREAMP

ONLY **$59/kit, $79** wired/tested

GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. **Tower mtg. hardware supplied.**

* Specify tuning range desired: 120-175, 200-240, or 400-500 MHz.

HRA -(*) HELICAL RESONATOR PREAMP

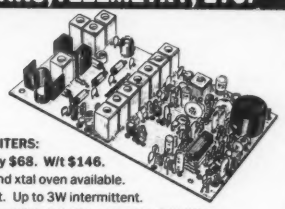


ONLY **$49** VHF or **$64** UHF

Low-noise preamps with helical resonators **reduce intermod & cross-band** interference in critical applications.

* Specify tuning range desired: 143-150, 150-158, 158-162, 162-174, 213-233, 420-450, 450-465, or 465-475 MHz.

HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **FM EXCITERS:** Kits only $68. W/t $146. TCXO and xtal oven available. 2W cont. Up to 3W intermittent.
- **TA51 for 10M, 6M, 2M, 150-174, 220 MHz.**
- **TA451 for uhf.** FCC TYPE ACCEPTED FOR COMMERCIAL BANDS.
- **VHF & UHF LINEAR AMPLIFIERS.** For FM or SSB. Power levels from 10 to 45 Watts. Several models, kits starting at $78.

- **R144/R220 FM RCVRS** for 2M, 150-174, or 220 MHz. 0.15uV sens, 8-pole xtal & 10 pole ceramic i-f filters, helical resonator front end for exceptional selectivity, >100dB at ±12kHz (best available anywhere!) Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit $138, w/t $198.
- **R451 FM RCVR.** Same as above but UHF. Tuned line front end. 0.2uV sensitivity. Kit only $138, w/t $198.
- **R76 VHF FM RCVR** for 10M, 6M, 2M, 220. As above, but w/o AFC or hel.res. Kits only $98 to $118.
- **R110 VHF AM RCVR** for VHF aircraft or ham bands or UHF. Kit only $98.

NOW—FCC TYPE ACCEPTED TRANSMITTERS, RECEIVERS, AND REPEATERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.

RECEIVING CONVERTERS

		Antenna Input Range	Receiver Output
VHF MODELS		28-32	144-148
		50-52	28-30
		50-54	144-148
Kit with Case	$49	144-148	28-30
		145-147	28-30
Kit less Case	$39	144-144.4	27-27.4
		146-148	28-30
Wired w/case	$69	220-222	28-30
		220-224	50-54
		222-224	28-30
UHF MODELS		432-434	28-30
		435-437	28-30
Kit with Case	$59	432-436	144-148
		432-436	50-54
Kit less Case	$49	439.25	81.25
		902-928	422-448
Wired w/case	$75	902-922	430-450

TRANSMIT CONVERTERS

		Exciter Input Range	Antenna Output
For SSB, CW, ATV, FM, etc. Can be linked with receive conv for tranceive. 1 to 2 W out. Linear PA's available up to 50W.	For VHF Model XV2 Kit $79 Wired $149 (specify band)	28-30	144-146
		28-29	145-146
		28-30	50-52
		27-27.4	144-144.4
		28-30	220-222
		50-54	220-224
		144-146	50-52
		144-146	28-30
	For UHF Model XV4 Kit $79 Wired $139	28-30	432-434
		28-30	435-437
		61.25	439.25
		144-148	432-436

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and will be transmitted at 60 wpm using 170-Hz shift.

Both broadcasts will be transmitted from the following stations on the listed frequencies: AAE, HF/MARS Radio Facility, Fort Sam Houston TX (4.0185, 6.9880, 9.9900); AAG, HF/MARS Radio Facility, Presidio of San Francisco CA (4.0215, 7.3095, 13.9945); AIR, 2045th Information Systems Group, Andrews Air Force Base, Washington DC (6.9955, 13.9975); NAM, Naval Communication Area, Master Station LANT, Norfolk VA (4.0050, 7.3930, 14.4000); NAV, HQ Navy-Marine Corps MARS Radio Station, Cheltenham MD (7.3725, 14.3895); NPG, Naval Communication Station, Stockton CA (4.0100, 7.3650, 13.9755); WAR, HQ Army MARS Radio Station, Fort Meade MD (4.0285, 6.9975, 14.4035).

Submission of Test Entries: Transcriptions of the CW and RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency, and callsign of the military station copied, as well as the name, callsign, and address of the individual submitting the entry, must be indicated on the page containing the test message.

Entries must be postmarked no later than May 23 and submitted to the respective military commands as follows: AIR (Armed Forces Day Test, 2045ISG/DOJM, Andrews AFB DC 20331-6345); AAE, AAG, WAR (Armed Forces Day Test, Commander, USAISC, ATTN: AS-OPS-OA, Fort Huachuca AZ 85613-5000); NAM, NAV, NPG (Armed Forces Day Test, Naval Communication Unit, Washington DC 20397-5161).

W4ODR ARMED FORCES DAY
MAY 16

For the 5th consecutive year, station W4ODR, located northside aboard Naval Air Station Memphis, Millington, Tennessee, will operate in recognition of Armed Forces Day on May 16 from 1300–2300 UTC. Frequencies: SSB—7.230, 14.280, 21.370 ±10 kHz); CW—21.145, 28.145; 146.52. Special red, white, and blue certificates will be available to those who work "Whiskey Four Old Dusty Rebel." No SASE required! Calls not in the callbook should QSL to Military Club Station W4ODR, PO Box 54278, Naval Air Station, Memphis, Millington TN 38054, providing frequency and contact number. Requests for additional information on the Armed Forces Day events at W4ODR, NAS Memphis, should be directed to: Station Custodian—Senior Chief Petty Officer Bob Donan KA4FAL (901)-872-2007; Special Events NCO—Sergeant Major Jim Moffatt WD4SMW (901)-363-0778; or Military Club Station W4ODR/Navy-Marine Corps MARS Station NNN0NIF, Bldg. N-100, NAS Memphis; (901)-872-5134.

WA4USN ARMED FORCES DAY
MAY 16

The Charleston ARS will operate special-event station WA4USN on Armed Forces Day, May 16, from the deck of the aircraft carrier *USS Yorktown CV-10*, located in Charleston, South Carolina. Operation will be from 1000–2200 UTC on 29.350, 14.250, 7.250, and 3.850. Special QSL cards will be sent to all confirmed contacts sending an SASE to Special Event Station, 346 Parkdale Drive, Charleston SC 29407.

ABILENE TX
MAY 16–17

The Key City ARC will hold its annual "Fly-in/Drive-in Hamfest" on May 16 and 17 at the Abilene Municipal Airport, three miles south of I-20 on Loop 322, just east of town and across from the West Texas Fairgrounds. Talk-in on area repeaters. Registration begins at 8 a.m. For more information, contact Bill Jones N5DOX at (915)-698-4606 or W. K. Wiggins WB5ZOO at (915)-673-1332 (no collect calls, please).

BIRMINGHAM AL
MAY 16–17

The Birmingham ARC will sponsor its BirmingHamfest '87/Alabama ARRL State Convention on May 16 and 17, beginning at 9 a.m. both days, at the Boutwell Auditorium, 1930 8th Avenue North, Birmingham, Alabama. Admission is $4 per person, under 12 free when accompanied by an adult (admission is good for both days). Amateur license exams given. Talk-in on 146.880. For more information, call Dan Morgan KB4MDI, BirmingHamfest Chairman, at (205)-822-5242, or write BARC, PO Box 603, Birmingham AL 35201.

YAKIMA WA
MAY 16–17

The Yakima ARC will sponsor the Central Washington State Hamfest on May 16–17 at Central Washington State Fairgrounds, 10th Street and East Nob Hill Blvd. Hours: Saturday, 9–5; Sunday, doors open at 7 a.m. Admission $5 each. Pre-registration due by May 2. Lots of tables: No charge to display electronics-related items only. Contact W7AQ (Yakima ARC, PO Box 9211, Yakima WA 98909) to reserve a table. Consignment sales, limit 10 items, 10% of sale price. ARRL VE testing Saturday at 1:30 p.m. Talk-in on 146.25/.85.

PARAMUS NJ
MAY 17

The Bergen ARA will sponsor its Spring Hamfest on May 17, from 8 a.m. to 4 p.m., at Bergen Community College, 400 Paramus Road, Paramus, New Jersey. Sellers $5, buyers free. Tailgating only. Bring your own tables. Amateur license examinations. Talk-in on 146.19/.79 and .52. For more information, contact Jim KK2U, 444 Berkshire Road, Ridgewood NJ 07450; (201)-445-2855 nights only.

WRIGHTSTOWN PA
MAY 17

The Warminster ARC will sponsor its 13th annual Hamfest on May 17, beginning at 7 a.m., at the Middletown Grange Fairgrounds, located on Penns Park Road in Wrightstown, Pennsylvania. Donation is $3 per person (XYLs and children free). Indoor spaces with 8-foot tables and power available at $5 each (pre-registration only). Unlimited outdoor 8-foot spaces available at $5 each (no pre-registration). Talk-in on 147.69/.09 and 146.52. For information and registrations, contact Frank Charlton KA3FBP, 1479 Kingsley Drive, Warminster PA 18974; (215)-675-2549.

DALTON MA
MAY 17

The Northern Berkshire ARC will sponsor a flea market on May 17, starting at dawn, at the Dalton American Legion Field on Rte. 9, Dalton, Massachusetts. Admission is $1 per person. Women and children admitted free. There is no charge for selling space. For further information, call (413)-458-8452 (days) or (413)-458-8267 (evenings), or write to the Northern Berkshire ARC, PO Box 591, Williamstown MA 01267.

OLD WESTBURY NY
MAY 17

LIMARC will sponsor the ARRL Long Island Hamfair on May 17, beginning at 9 a.m., at the New York Institute of Technology, Rte. 25A/

"The RC-850 Repeater Controller ... still the leader of the pack!"

The RC-850 controller offers your group the most advanced repeater control technology available anywhere. Through ongoing hardware and software enhancements, even our first customers enjoy new features that keep it ahead of the pack.

With the '850, your repeater becomes fully remotely programmable. From command codes to the repeater's operating schedule, virtually everything can be easily changed. Touch-Tone programming from your radio or the phone with synthesized voice readback, or programming from your home computer via modem or packet.

The autopatch supports local and radio-linked remote phone lines, extending your patch coverage to match your RF coverage. You don't even need a phone line at your site! The 250 autodial slots meet everyone's needs, with up to 35 digit storage for personal MCI/Sprint codes.

The easy-to-use mailbox lets you include phone numbers, times, or frequencies in messages. The controller is so smart, it'll leave you a message if you miss a reverse patch or an alarm.

Selective call capabilities range from CTCSS and two-tone to display paging, so you can always be available without having to listen. Voice response telemetry lets you remotely meter your site. Its continuous measurements with storage of updated min and max readings let you find out how cold it gets, how high the reflected power reads . . . and when.

Individual user access codes, with callsign ID, offer secure access to selected functions to completely prevent horseplay.

The industry's top-of-the-line controller, now better than ever, for *your* repeater.

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Northern Blvd., Old Westbury, New York (Exit 39 North, Route 495, north on Glen Cove Road, 2 miles to 25A, turn right 1 mile to site). General admission, $3. All hams must buy a ticket; wives, children, and sweethearts free. Sellers' car space, $5; outdoor tailgating, no reservations needed. Talk-in on 146.25/.85. For further information, call Hank Wener WB2ALW at night at (516)-484-4322.

OLD BRIDGE NJ
MAY 17

The largest indoor computer and hamfest in central New Jersey, the OBRA annual festival will be held on May 17, beginning at 8 a.m., at Old Bridge Civic Center Arena, Cottrel Road and Highway 516, Old Bridge, New Jersey. (Easy access—Rte. 9 to Highway 516E, 3/4 mile to Civic Center.) Sellers: indoor $12, tailgating $8. Buyers $5 (save $1 if ticket is bought in advance). Table admits one. XYL, kids under 12 free. Exams given; pre-registration preferred. Walk-in registration at 9 a.m., testing at 10. Talk-in on 7.12/7.72. For more information or to make reservations (check payable to OBRA), contact Chris Mohr N2DHN, 50 Harrison Place, Parlin NJ 08859; (201)-727-1769.

ABEGWEIT AWARD DAY
MAY 17

The Prince Edward Island ARA will celebrate Abegweit Award Day on May 17 somewhere in the wilds of P.E.I., from 1200 UTC to approximately 0000 UTC. Modes: SSB and CW only. Recommended frequencies: CW—21.100, 14.050, 7.100, 3.700; SSB—21.300, 14.250, 7.200, 3.800. For more information and rules, contact Dave Smith VE1CIK, Box 529, Kensington, Prince Edward Island, C0B 1M0; (902)-836-4246 (after 2200 UTC).

KNOXVILLE IL
MAY 17

The Knox County RC, Inc., will hold its annual Knox County Hamfest on May 17, beginning at 7 a.m., at the Knox County Fairgrounds in Knoxville, Illinois. ARRL/VE testing will be given near the hamfest site. Talk-in on 147.00/146.40 and 146.52. For table reservations, pre-registration of testing, and advance tickets, contact Keith L. Watson WB9KHL, 119 South Cherry Street #3, Galesburg IL 61401-4527; (309)-342-3885 (evenings).

ATHENS OH
MAY 17

The Athens County ARA will hold its 8th annual Hamfest on May 17, from 8 a.m. to 3 p.m., at the City Recreation Center on East State Street. Admission will be $4 for each person attending. Indoor space is available by advanced registration only. (Contact Walt Jones N8DDL, 17 Berkley Drive, Athens OH 45701; 614-593-7871.) License examinations will be offered at all levels. (Mail completed Form 610 and a check for $4.35 payable to ARRL/VEC to John Cornwell NC8V, Exam Coordinator, 101 Coventry Lane, Athens OH 45701.) Talk-in on 146.34/.94. For general information, write to Carl J. Denbow KA8JXG, 63 Morris Avenue, Athens OH 45701.

WABASH IN
MAY 17

The Wabash County ARC will hold its 19th annual Hamfest, beginning at 5:30 a.m., on May 17 at the Wabash County 4-H Fairgrounds (State Road 13) in Wabash, Indiana. Donations are $4 at the door and $3.50 in advance. Advance reservations are requested. Inside tables are $10. Unlimited outdoor flea-market space. Amateur radio exams given. Talk-in on 147.63/.03, 146.52, and 146.94. For advance tickets or further information, contact Don Spangler W9HNO, 235 Southwood Drive, Wabash IN 46992; (219)-563-5564.

BLUEFIELD WV
MAY 17

The East River ARC, Inc., will hold the Bluefield Hamfest on May 17, from 9 a.m. until 3 p.m., at the Bluefield Recreation Center, 1/2 mile north of U.S. 460, near the Virginia/West Virginia state line. Walk-in exams at 9 a.m. ($4.25 fee for all exams except Novice) at Bluefield State College, Bluefield, West Virginia, in the first building on the right after entering the campus.

RANDOLPH OH
MAY 17

The Portage ARC will hold its annual Portage Hamfair on May 17, from 8 a.m. to 4 p.m., at the Portage County Fairgrounds, located on Rte. 44 between Interstate 76 and Rte. 224 in Randolph, Ohio. Tickets are $3 in advance and $3.50 at the gate. Inside display tables (with chair) are $8, and outside flea market space is $3 per space. Talk-in on 144.79/145.39. For table reservation and additional information, contact Joanne Solack KJ3O/8, 9971 Diagonal Road, Mantua OH 44255; (216)-274-8240.

CHICAGO IL
MAY 17

The Chicago ARC will hold its annual Mini-Hamfestation on May 17, from 9 a.m. to 3 p.m., at North Park Village, 5801 N. Pulaski, Chicago, Illinois. Admission $1. Half table $3, full table $5 (admits one seller). For info, call 545-3622.

KANKAKEE IL
MAY 17

The Kankakee Area Radio Society will sponsor the annual Kankakee Hamfest on May 17, from 8 a.m. to 4 p.m., at the Kankakee County Fairgrounds. Limited flea market tables. Admission $2.50 in advance, $3 at the door. Talk-in on 146.34/.94. More information from KARS, c/o Frank DalCanton KA9PWW, RR #1, Box 361, Chebanse IL 60922; (815)-932-6703 (after 5 p.m. CST) or (815)-937-2452 (before 5 p.m. CST).

PAGE DISTRICT WORKS HQ
MAY 17

The ham radio operators of Union Electric Co. will operate special-event station KA@AWS on May 17, from 1900–2400 UTC, to commemorate the many years of operation attained by the Page District Works Headquarters, which was opened in the 1920s and just closed in February, 1987. Frequencies will be 3.950, 7.230, and 14.235 ±QRM. For a special 8-1/2 x 11" certificate, send a 9 x 12" SASE (39¢ postage) with your log number to KA@AWS, 241 Tapestry Drive, St. Louis MO 63129.

SOUTHINGTON CT
MAY 17

The Southington ARA will hold its 4th annual Flea Market on May 17, from 9 a.m. to 2 p.m., at Southington National Guard Armory, 590 Woodruff Street, Southington, Connecticut. Admission is $2. Tables: $8 in advance, $10 at the door. Two persons admitted with each table purchased. Cut-off date for tables is May 11. All classes of exams will be given from 10 a.m. to 2 p.m. To pre-register, write to Vincent Calandra, 44 Matthews Street, Southington CT 06489. Talk-in on 146.28/.88 or 145.600. For further information, call Chet

"The Digital Voice Recorder echos your thoughts"

ACC's Digital Voice Recorder allows you to remotely record your voice over the air using digital storage in its huge memory array. PCM recording results in the highest possible fidelity, so you're proud of how it sounds on your repeater.

The DVR's voice mailbox gives your repeater users computer bulletin-board like capability from any radio with a mic and Touch-Tone pad. With messages stored in voice, your users don't need special gear to enjoy the latest in communications technology (from anywhere).

Your repeater's IDs and other messages can consist of remotely recorded DVR audio tracks which can provide information to your users — about your system, club, meetings, and special events. And you can make your repeater the friendliest around. With its no-compromise high quality PCM digital audio processing, even famous celebrities can sound like they're live at your repeater site!

The DVR connects easily to your RC-850 or RC-85 controller. And one DVR can support up to *three* repeaters for a cost effective installation.

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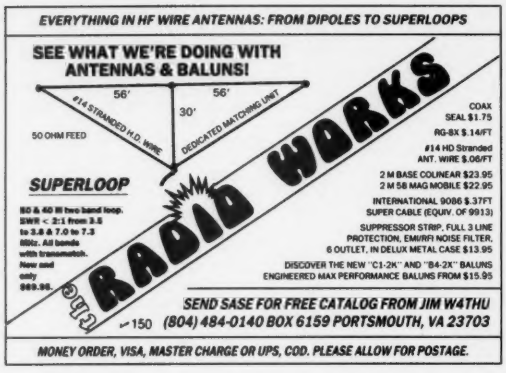
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TAYLOR MO
MAY 17

The Western Illinois ARC will hold its second annual Tri-State Swapfest on May 17 in conjunction with Fly-in-Breakfast sponsored by Chapter 488 of the Experimental Aircraft Association. The event will be held at Haerr Field, six miles west of Quincy, Illinois, in Taylor, Missouri (at the junction of Rtes. 61 and 24). General admission begins at 9 a.m. VEC exams for all license classes will be given. Talk-in on 147.03. For more information, write to The Western Illinois ARC, PO Box 3132, Quincy IL 62301.

SAMUEL MORSE DAY
MAY 23

The Bay Area ARS will operate special-event station KM3I on May 23, to commemorate the anniversary of Samuel Morse's first broadcast from Washington, DC, to Baltimore, Maryland. Operation will be CW on 40, 20, and 15 meters, 25 kHz up from the low end of the band, ±5 kHz. For a commemorative certificate, send log information and 8 x 10 SASE to BAARS, PO Box 805, Pasadena MD.

DURHAM NC
MAY 23

The Durham FM Association will hold its annual hamfest on May 23, from 8 a.m. until 4 p.m., at the lower rear deck of the South Square Mall in Durham, North Carolina. Tailgating is free. FCC exams given. Talk-in on 147.825/.225.

TUCKERTON WIRELESS TOWER 75TH
MAY 23–24

The Old Barney ARC of Southern Ocean County, New Jersey, and the Tuckerton Historical Society will sponsor the operation of special-event station KT2W, from 0001 UTC on May 23 through 2359 UTC on May 24, to commemorate the 75th anniversary of the start of construction of the Tuckerton Wireless Tower. Frequencies: CW—160–10, 50 kHz up in CW bands; phone—1.850, 3.890, 7.250, 14.280, 21.380, 28.480, 144.220, 146.52, local repeaters, and others. Special QSL via KT2W. Send SASE.

CARROLL COUNTY 150TH
MAY 23–24, 30–31

The Carroll County ARC will operate K3PZN from 1300–0100 UTC on May 23, 24, and 30, and from 1300–1900 UTC on May 31, in celebration of Carroll County's Sesquicentennial. Operation will occur in the lower 50 kHz of the General phone bands. For an 8-1/2 x 11 certificate, send QSL and SASE to Carroll County ARC, PO Box 2099, Westminster MD 21157.

WEST FRIENDSHIP MD
MAY 24

The Maryland FM Association will hold its annual Hamfest on May 24, from 8 a.m. to 3 p.m., at Howard County Fairgrounds, West Friendship, Maryland (I-70, 30 miles west of Baltimore). Donation $3. Inside tables by advance registration $7, at the door $10, if available. Talk-in on 146.16/.76, 222.16/223.76, or 449.1/444.1. For tables or information, contact Jim Clifford N3FBV, 7461 Terry Street, Ft. Meade MD 20755; (301)-674-4752.

QUEBEC
MAY 24

The Quebec Provincial Hamfest will be held on May 24, beginning at 9 a.m., at the Tracy Curling Club. Admission $4. Tables: outdoor $6, indoor $8. Limited quantity; please reserve before May 15. For more information, write to Sorel-Tracy ARC, PO Box 533, Sorel QC J3P 5N6 Canada.

GOLDEN GATE BRIDGE 50TH
MAY 24–25

The Marin County ARC will operate W6SG from 1500 UTC on May 24 until 0300 UTC on May 25 to commemorate the 50th anniversary of the Golden Gate Bridge. Suggested frequencies: CW—3.700, 7.100, 14.050, 21.100; phone—3.900, 7.250, 14.275, 21.350 ±QRM and interest. For a special QSL card, send an SASE (#10 business) with QSL card and contact number to MARC, PO Box 1231, San Rafael CA 94901.

CONSTITUTION 200TH
MAY 25

Amateur radio celebrates the bicentennial of the Constitution of the United States. Stations in Washington, D.C., and Philadelphia, Pennsylvania, will celebrate the meeting of the constitutional congress. Washington stations will be NN3SI (the Smithsonian Institute) and W3DOS (the Dept. of State). The Philadelphia station will be K3MTK. Stations will be on the air during the day and evening starting at 1500 UTC, somewhere in the lower third of the 20-, 40-, and 75-meter portions of the General bands. Other stations may join and will identify themselves as constitution stations. For Washington contacts, send a #10 SASE with your QSL card to NN3SI, Communications Exhibition, National Museum of American History, Smithsonian Institution, Washington DC 20560. For Philadelphia contacts, send them to WB2YEH, 7258 Walnut Avenue, Pennsauken NJ 08109. Write "Constitution" on the outside of your envelope in the lower left corner.

SIOUX CITY NE
MAY 29–31

The 3900 Club and the Sooland ARA are collaborating on Hamboree #9 to be held May 29–31 at the Marina Inn in south Sioux City, Nebraska. Several seminars will be featured. Convention admission is $5. For convention registration, write to Dick Pitner WØFZO, 2931 Pierce Street, Sioux City IA 51104. Flea market tables are $4 each. For table reservations, write to Al Smith WØPEX, 3529 Douglas Street, Sioux City IA 51104. Exams will be given Sunday morning at the Marina. Send $4.25 and your request for a Form 610 to WØFZO. Talk-in on .37/.97.

MIDLAND MI
MAY 30

The Central Michigan Amateur Repeater Association will sponsor its 13th annual Hamfest on May 30, from 8 a.m. until 1 p.m, at the Midland Community Center in Midland, Michigan. Admission is $4. Tables $8 and $4. Amateur radio license exams given. Talk-in on 147.00/.60. For more information, contact CMARA Hamfest, PO Box 67, Midland MI 48640 (please SASE); (517)-631-9228 (evenings and weekends).

SKANEATELES NY
MAY 30

The ARCS and Skaneateles Lions Club will sponsor the 1st Skaneateles Ham and Computer Fest on May 30, from 8 a.m. to 5 p.m., at Allyn Arena, Jordan and Austin Sts. in Skaneateles, New York, 25 miles west of Syracuse on U.S. Rte. 20. Admission is $2.50 in advance, $3 at the gate. Outdoor flea market is $2.50 in advance, $3 at the gate. Indoor flea market (8-foot table) is $8 in advance, $10 at the gate. Kids 12 and under free, if with attendee. Advance tickets by May 16. Walk-in VE license exams given ($4.35 payable to W5YI/VEC) at 11 a.m. Talk-in on 147.00/146.40 and 442.3. For reservations or more information, call Hank Bryant at (315)-685-7658, or write to Skaneateles Hamfest, 49 Elizabeth Street, Skaneateles NY 13152.

JEFFERSON DAVIS' B'DAY
MAY 30–31

The Confederate Signal Association of South Mississippi will operate a special-event station on May 30–31 to celebrate Jefferson Davis' birthday. Operation times will be 1800 UTC Saturday to 1900 UTC Sunday. The frequencies planned are 21.150, 21.350, 28.150, 28.350, 50.150, 144.150, and 432.150. QSL via W. R. Jeffrey KA4CRT, PO Box 923, Gulfport MS 39502-0923.

NEWINGTON CT
MAY 31

The Newington Amateur Radio League will hold its fourth annual flea market on May 31, from 9 a.m. to 2 p.m., at Newington High School, Willard Avenue (Rte. 173), Newington, Connecticut. Admission is $2 at the door. Indoor tables $8.50 ($10 after May 23), tailgating is $5. Amateur radio exams will be offered. Talk-in on 146.52, 144.85/145.45, or 223.24/224.84. For exam information or table reservations, contact Les Andrew KA1KRP, 23 Grove Street, West Hartford CT 06110; (203)-523-0453. Enclose an SASE for reply or confirmation.

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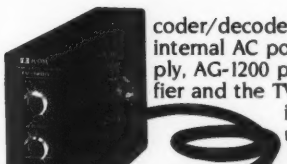

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

YARP

In honor of the month, "MAY" I tell you about a little item I just received? John Langner WB2OSZ of Chelmsford, Massachusetts, has written a "simple" RTTY program for the Atari ST. In a bit, you'll see why I put the word "simple" in quotes. Anyway, John notes that there is an Atari Microcomputer Network, which gets together on Sundays at 1600 UTC on 14.325 MHz (moved a tad for QRM if need be). This might be a good place to start if you are interested in putting an Atari on the air.

The program, called Yet Another RTTY Program (YARP), is far from "simple." Featuring both Murray (five-level) and ASCII operation; a split-screen display; a time and date status line; built-in CQ, RYRY, and Quick Brown Fox messages; editing; a type-ahead buffer; printer output; and the ability to transfer data to and from disk files, this program clearly classes with many other systems' full-featured programs.

YARP is set up to use an external terminal unit (demodulator, modem, or ___ [fill in your favorite term]). The serial port connector on the back of the ST is used (with standard pin assignments used) and the RTS line is used to key the transmitter.

The split screen I mentioned provides for an upper segment for received date, a status line across the middle, and a transmitted data segment across the bottom. On the very last line, a mini help line is provided. All input is through the keyboard, with the function keys serving to select various program options.

A copy of this program may be obtained by sending a blank diskette and $1 to the Atari Microcomputer Network, c/o John Adams KC5FW, 17106 Happy Hollow, San Antonio TX 78232. That's quite a bargain for a buck! Oh, by the way, John also tells me that the Network has a newsletter, information about which may be obtained from Gil Frederick VE4AG, 130 Maureen Street, Winnipeg MB R3K 1M2, Canada. Good luck, Atarians, and don't forget to mention RTTY Loop in your correspondence.

VHF/HF Packet Operation

A letter from Roger Owen WD8DJR points up one possible problem when you're trying to get a modern SSB transmitter onto RTTY. Roger details his problems with putting an AEA Pakratt (PK-64) onto RTTY with his Kenwood 530S.

Roger's first problem was a bum chip in the Pakratt, which apparently took quite a while to clear up between his local dealer and AEA. He finally retrieved his Pakratt, and although he says it works fine on VHF packet, he feels that it "isn't worth a 'hoot' when I try to copy RTTY signals on HF." According to Roger, his Pakratt does have the HF modem installed. He describes his 530S as with "all 'bells and whistles' and has a 500-Hz CW filter installed; no SSB filter, however." Well, Roger, that may just be the problem.

While operation on VHF vs. HF packet may look the same, the rf side of the picture is quite different. On VHF, the standard tones used follow the Bell 202 format, with tones at 1,200 Hz and 2,200 Hz. The center frequency, if you will, is 1,700 Hz and your radio must be able to pass the frequencies above and below the center, so as to pass the mark and space tones. On HF, however, Bell 103 tones are used, with a center frequency of about 2,125 Hz, and tone pairs of 2,025 Hz and 2,225 Hz. Now, your rig is equipped with a CW filter, which is set up to pass tones in the range of 450 to 950 Hz. You see the problem? You can't get the correct tones through that CW filter.

My suggestion would be either to invest in an SSB filter, which would pass the required tones, or to switch the CW filter out altogether and let the modem filter the audio for you. You have fine equipment there, Roger; you just have to remember the specifications of the signals you are dealing with. Please be sure to let us all know when you are "connected."

"While operation on VHF vs. HF packet may look the same, the rf side of the picture is quite different."

The AEA PK-232

R. George Newton, Jr., DDS WB2VUN of Skaneateles, New York, is looking for the best "black box" to hook his TS-430S to his Apple II Plus computer to get on RTTY. Best? Boy, have I dealt with that one before. Let me go out on a wire, though, and mention the AEA PK-232 this month. I am looking at one, and it is lovely!

I will try to tell you all more about it as I have fun with it; but for now, if suffices to say that if you can run a modem from your computer, you can run this one. And run it on on RTTY, CW, packet, and even AMTOR. It looks like the machine for all seasons. I don't know if it truly is the "best," but it certainly must be one of the finest.

Watch here for my future thoughts on this one...soon! In the meantime, look through the August, 1986, packet issue of *73*, and you might want to peruse the survey article in the March, 1987, issue of *QST*, which gives a capsule description of just about everything on the market. I would be interested in what you come up with. Be sure to let us know.

MODEM MGR

The Apple //c is one computer that I have seen more questions about than answers. John Rigsby NØFAC of Northglenn, Colorado, passes along his impression of one Apple communications program, MODEM MGR.

John says that MODEM MGR is a versatile program that can be used on Apple][+, //c, //e, or enhanced //e computers, under DOS 3.3 or ProDOS, and that it supports most serial and modem cards. An INSTALL program allows the preselection of options such as 80/40-column display, split screen, menu display, and control keys.

The net result of this is that once the program is configured, you can apparently boot and run it with a minimum of fiddling around. It supports disk transfer and XMODEM protocol for file transfers, and it has a full-featured screen editor, I am told. There also are user-defined macros that can hold station ID information, CQ, QBF, or the like.

John feels that the combination of the Apple //c and MODEM MGR, coupled with a good demodulator (he used the Theta-777), is excellent for getting onto RTTY, as well as landline communication. He does sound as though he's found a winner.

MODEM MGR is available from MGR Software (Suite 101, 305 So. State College Blvd., Anaheim CA 92806) for $49.99 plus $3 shipping and handling, according to the company. They do not advertise in amateur radio magazines, so if you do contact them, be sure to let them know that readers of *73*'s RTTY Loop are aware of their existence, and that advertising in *73* might not be a bad idea!

Hassle-free RTTY

Anyone who writes me on notepaper headed "TEXAS TURKEY" and punctuated by a picture of an armadillo at the bottom can't be all bad, so let me turn to a note I received from Paul Johnston KA5FVI of Austin, Texas. Paul is another ham looking to get onto RTTY "with as little hassle as possible. Do you have a free silver platter?"

I mention Paul's letter separately because he raises a common point. He says he feels no need for a computer, unless it might help him in this venture. And one of the things he especially would like to do is receive digital communications, on a variety of modes, and store them for later review. Well, I would say that a computer would be the best way to go!

There are several options. You could stay cheap, with a fully software-based system around a C-64 or CoCo, or you could use almost any computer capable of communicating with a modem and saving things to disk and interface through one of the more versatile RTTY-modems, such as the Pakratt mentioned above or the Kantronics KAM or UTU.

My own bias is to get the best you can afford. If you want to get your feet wet, go ahead and wander around the bands with a software system; many have been mentioned here in the past. But when you want to get serious, I suspect that you'll want to go for a full-featured modulator/demodulator that can support all the modes you will want to cover.

You may do well to read that review article, too, and be sure to let us all hear from you as to how you make out.

Info Needed

Turning to harder topics, Robert G. Unger WB3DTB of Nazareth, Pennsylvania, needs some information about a Teletype® Model 32 he is working on. Bob wants to hook up the 32 via the terminal strip in the back and needs the pinouts. I've got to beg off on this one. I don't have any documentation for the Model 32. Certainly some of our readers do, though, and I will be happy to pass along the information to Bob—and to the rest of the gang if one or more of you would send it to me. OK? Thanks.

Increasing HD-3030 Sensitivity

An old friend, John Davison W0ZFN of Kirkwood, Missouri, dropped me a line the other day. An old 6800 buddy, he has just obtained a Heathkit HD-3030 (which he says is really a Flesher 470 in disguise) and has a problem. John says that a 100-mW signal is required to saturate the limiter, so that signals buried in the noise just don't hack it. He asks if there is any way to increase the sensitivity of the unit.

Well, John, the obvious answer is to put an audio preamp between the receiver and terminal unit, but I don't think that is a realistic answer because you will end up with as much noise as signal. I don't know what kind of receiver you are using, but filtering may be the answer you are looking for.

Ideally, you should have a bandpass large enough to accommodate the signal you are receiving, and no larger. This will clearly change from CW to various RTTY or packet modes; one filter, which may be perfect for one mode, just will not do it all. Typically, if you are using too wide a filter, you will be including all kinds of extraneous junk, which will serve only to damp down the signal you are looking for. Conversely, if you are using too narrow of a filter, one of the tones you need, or both, may be outside of the filter and be attenuated.

Although I wrote Heathkit about the HD-3030, they were unwilling to part with any information. I have not heard much from readers either on the unit. Why? Readers?

All For Now

You are a vocal lot, RTTYers, and, as always, I enjoy your letters and questions. Those of you who have sent me E-mail via CompuServe or Delphi have found responses in your mailboxes within days—sometimes hours. Letters take a bit longer, but I think I am finally caught up.

If you have sent me a letter and more than a month has gone by, there is a good chance that either it has gone astray or it has somehow insinuated itself into one of the piles of papers in my office. At any rate, please feel free to ring my chimes with a reminder.

As one of you wrote, though, "I guess the reason no response has appeared in my mailbox is that I have not sent an SASE, right?" Right. With the amount of mail I receive, I do appreciate the consideration, as do most authors, of your including a self-addressed, stamped envelope with any letter you wish me to answer personally. Of course, letters of general interest will continue to find their way into this column, SASE or not.

The reprint list is alive and well, with a sheet detailing what's available for an SASE to the above address. I hope to have some new wrinkles in the list by summer. You might drag your feet sending a request until then, unless you really are looking for something now.

Whether written, via USPS to the above address, or by E-mail via CompuServe (75036,2501) or Delphi (MARCWA3AJR), I do enjoy your letters, questions, and comments. I hope to have a few real fireballs for you over the summer, just the thing to light up the skies, courtesy of RTTY Loop.■

NK6K > PACKET

Harold Price NK6K
1211 Ford Avenue
Redondo Beach CA 90278

THE YEAR IN REVIEW

Well, here it is, my first year's anniversary writing a column for *73* Magazine. Things have worked out pretty much as I thought they would. I promised Perry Donham that the only column that would be on time was the first one, and that's been true ['tis true—eds.]. I still don't agree with everything Wayne says. And one prediction that didn't take much smarts—packet is still growing. We've shared 148,410 bytes of NK6K > Packet (before editing) in 11 columns (there was no packet column in the August gala packet issue). Your input is solicited.

In the May 86 column, written in February 86, I included a capsule history of amateur packet development up to that time. Most of the work mentioned as under development is either completed or continuing. The TCP/IP software development in New Jersey has expanded to other areas of the country. The Texas software (TEXNET) is up and running. There are now an estimated 30,000 TNCs in the world.

1986 was the year that multimode TNCs hit it big, and a 2400-baud TNC didn't. It was also a year when the hoped-for commercial 9.6K and 19.2K modems didn't appear. Rumors indicate that high-speed modems will be on display at Dayton this year. Let's hope so. The JAS-1 spacecraft was launched in 1986; Phase 3C was delayed until 1987.

PACKET APPLICATIONS

I'm always interested in what people are doing with packet. Placing applications on the network is as interesting as building the network itself. A couple of interesting things have popped up in California recently. If there are any interesting packet applications in your area, write in or send me a packet message at NK6K @ NK6K.

Weather

The first interesting application I'll discuss this month is the weather node run by Bill Hutchins KB6CYS in Cypress, California. There are other weather-reporting systems connected to TNCs around the country, but to my knowledge, Bill is the only ham doing his own predictions and making them available along with the report on current conditions.

For those who don't have a local weather node, when you connect to one, you get a report of local weather conditions. When you connect to KB6CYS, you get a report on several weather parameters, plus a few lines of text giving Bill's prediction of the weather for the next 24 hours. Bill forecasts twice a day as time permits. His description of his system follows:

"The system consists of two Apple //e computers, a TNC-1 with DED firmware, and a Heathkit ID-4001 weather computer with a custom interface card to latch data for a four-port parallel interface in the Apple. One of the Apples runs a data acquisition program written in Basic that reads the data from the weather computer and stores the information as variables. This info is displayed on the monitor and is also held for output to the TNC.

"The info sent to the TNC when someone connects consists of wind speed and direction, temperature, dew point, barometric pressure, rate of change and rise/fall of pressure, maximum and minimum temperatures, total rainfall since midnight, and total rainfall for the month. I also have displayed locally the average wind direction over past hour, peak wind gust speed and time, wind chill, and rainfall start and stop times.

"A local forecast is also provided upon connect. The forecast is based mostly on the National Weather Service forecast, although I tend to deviate occasionally from theirs based on what I've seen happen in this area along with the info from the weather computer. I have caught several storms so far this year that the NWS did not forecast. I also 'blow it' occasionally when I deviate.

"I try to change the forecast twice daily when my time permits. Other neat gimmicks are in the works for this system, such as weather-related files, weather history, conversion charts, etc."

Because Bill is forecasting for his immediate (small) area, he is sometimes able to best the professional forecast, which is usually reporting on averaged conditions for a much larger area. An amateur network of weather stations could prove useful for VHF propagation predictions, especially in our coastal region where ducting is common.

White Pages

The second application this month is the "white pages" program written by Eric Williams WD6CMU in El Cerrito CA. His documentation describes it best:

"WP stands for 'white pages'

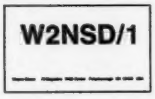
UNCLE WAYNE'S

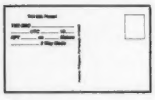
BOOK SHELVES

Style W

Style X

Style Y





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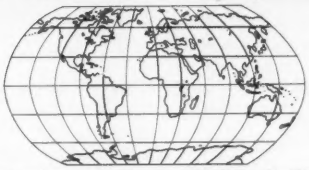

Yes, places you've never even heard of! Nearly 400 DX countries gleaned from the Awards Lists of dozens of IARU members—more countries than any other map available anywhere! ARRL's DXCC map doesn't even come close!

73 Magazine offers readers our DX Map of the World for the absurdly low price of only $5.00, shipping and handling included.

Your ham shack will be incomplete without this giant, 950-square-inch, up-to-date map. It's printed in classic black and white, permitting you to color the countries in after you've QSL'd them.

Save yourself the humiliation of never having heard of McDonald Island (what's the prefix?), Jan Mayen (prefix?) or Kure Island (prefix?).

Order now....

Code Tapes

We've had so many phone calls from people wanting our famous 73 code tapes that we've decided to bring them back!

"Genesis"

5 wpm-This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

"The Stickler"

6+ wpm-This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

"Back Breaker"

13+ wpm-Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

"Courageous"

20+ wpm-Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

Classics From 73's Library

• ***The Magic of Ham Radio***, by Jerold Swank W8HXR, begins with a brief history of amateur radio and Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdon's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. Only $4.95.

• ***The Contest Cookbook***, by Bill Zachary N6OP. One of ham radio's winningest contesters lets you in on the tips and techniques of the Big Guns. You'll learn which duping method to use, find out what equipment you'll need, and discover the secret of building a pileup. Includes separate chapters on DX and domestic contests. $5.95 while they last!

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ORDER FORM

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"QSL orders: Allow 4–6 weeks for delivery."

and is a directory system for packet radio mailboxes. It allows remote query and updating of a database that lists the users of RLI-compatible mailboxes and their home BBS. To use the program, a message is sent to 'WP' at WD6CMU. The message can have several lines (a single message can contain several queries and updates), but each line must have one of the following formats:

<callsign> QTH?
<callsign> QTH <mailbox>
DE <callsign> @ <mailbox>

"The first form is a query and will return the home BBS of the person with the given callsign. The second form adds or changes the entry for the given callsign, storing his home mailbox with his callsign. The third form provides a return address for the requested information. If the message does not contain a line of the third form, the WP program will try to get the return address from the forwarding headers. This will work as long as the mailboxes in the forward path use the [@:call] format for forwarding headers.

"Replies will be sent to the originating station at the mailbox specified as described above. The reply will be generated a few minutes after the message is received at WD6CMU. Currently, the WP program is run every 15 minutes, so that is the maximum wait for a reply. Of course, queries sent from other mailboxes will have to make their way through the forwarding system, as will the reply."

Like several other lists of users, it is only useful if a large number of users are listed. If you have a similar system in your area or if someone is maintaining a list and distributing it, I hope you'll add your name and home BBS.

HEADER WARS

In the February column, I reported on the header wars. Headers are lines that each forwarding BBS adds to the front of a message as it is passed through that station. Headers can be useful, as shown by the WP program discussed above. In that example, the program can automatically return a message to the originator. The scheme works only if the header is a standard format.

Picking the standard format is what the header wars are all about. The war has cooled down a bit; almost everyone is tired of discussing the topic.

One of the last proposals to be made was a scheme that would make it possible to have almost any piece of information (lat/long, area code, etc.) present in the header while maintaining readability. The format was not order-dependent, so that the local sysop could have items in any order he wanted (see Fig. 1).

```
R:870312/0648  @:WB6KAJ Brea, So. Calif. #: 4341 O:KR5S  F:145.36/14.109
R:870311/1905z @:WD9DHI Cedarburg, WI #:3604 O:KR5S F:14.109/145.09
R:870309/0657  @:W1HAB Boulder, Co. #:2028 O: KR5S
R:870309/0853z @:W3IWI Balto/Wash #:9986 O:KR5S  F:14.109/221.01
R:870309/0628z @:W3IWI Balto/Wash #:947 O:KR5S F:145.05/221.01/145.01
R:870306/1746z @:WB7DCH Enumclaw, WA G:CN97 #:113 O:KR5S
R:870306/1643z @:W9ZRX *** IndyGate *** #:17452
R:870306/1641z @:KR5S Sedona, Az. #:4873  O:KR5S   F:145.01/14.109
```

Fig. 1. Headers in the latest proposed standard format.

Much of the western and midwestern U.S., Canada, and part of the East Coast have switched to that format. All of California has switched, making more programs like WP possible.

I won't bore you with the details here; the format is on CompuServe's HAMNET forum, and it has made the rounds through the forwarding BBS system. It is called the VE3GYQ/W3IWI/WB6KAJ/NK6K/WB6YMH proposal. W0RLI reported at the recent TAPR meeting that he and WA7MBL had agreed on using that format in their BBS software and will hard-code the order of the first few fields.

The WB6YMH BBS takes advantage of the standard header format in a different way. A user-selectable option causes messages to be displayed with all of the headers stripped out, except for the header from the originating station. This allows BBS sysops to manage and gather statistics on the network, while not showering the user with unwanted bytes.

TAPR MEETING

The 1987 general membership meeting of Tucson Amateur Packet Radio was held in late February in Tucson, Arizona. If you are new to packet, you may not know about TAPR.

In 1983, TAPR, a nonprofit R&D club, came out with a kit-based terminal node controller that could easily be assembled and put on the air. Included were all of the hardware, software, and documentation needed, and it was the first all-in-one package. TAPR sold the rights to manufacture TNCs using this design—including the negatives of the circuit board and silk screen, the machine-readable source code, and the manual—to all comers for $500.

The first AEA TNCs used the entire design. The first Kantronics TNCs used the software. TAPR was able to prove, with the 2,500 kits that it made and sold, that there was sufficient interest in packet radio in the amateur community to justify the expenditure of cash by mainstream amateur manufacturers. From that "guaranteed market" base has come the new R&D we've seen from sources other than TAPR.

TAPR also standardized a user interface. Though more suited for human users than for computer-to-computer interface, the TAPR command set provided "interoperability" across manufacturers' products. That made it possible to develop standard BBS software and resulted in the W0RLI message-forwarding system.

Even hardware that was not derived from TAPR hardware maintained compatibility with the old standard. Such hardware (for example, the AEA PK-232) is now providing a bridge between the old 1983 standards and future standards. The newer PK-232 ROMs contain a new computer-to-computer interface suitable for use with the TCP/IP network software. TAPR's goal of seeding the market and getting things started has been met.

Although TAPR "gave away" rights to the TNC-1, they (or I should say we since I'm a member) sold the rights to their next effort, the TNC-2, on a different basis. The rights to the TNC-2—on which the MFJ-1270, the GLB TNC2, the AEA PK-80, the PACCOM TNC-200, and others are based—were sold for $5,000 plus royalties of $5 to $3 per unit on a sliding scale. This was done for two reasons. One was to pay off the debt accumulated during the TNC-1 days—TNC-1s were sold at cost; the cabinets were sold below cost. The other was to raise money for future development.

TAPR is actively seeking new projects to support with this money. We're primarily interested in things that the large manufacturers would not be, important things with limited demand, things for which a large guaranteed market does not (yet) exist.

TAPR pays for tools and supplies, and reimburses communications and travel costs; it does not pay salaries. The only TAPR person paid for labor is the woman who answers the phones and picks up the mail. TAPR also pays for packaging and distribution of kits—for example, the K9NG 9600-baud modem.

TAPR can get involved a little or a lot, depending on the desires of those involved. On one end of the scale is a TAPR project like the PSK modem. Spearheaded by Tom Clark W3IWI, the PSK modem, suitable for use with JAS-1 and terrestrial work, was done entirely under TAPR's auspices. All development hardware was paid for by TAPR, and the product will be kitted and distributed under TAPR's name.

On the other end of the scale is the W0RLI/VE3GYQ/et al BBS project. TAPR assisted in that project by paying more than $1,000 in communications cost between the developers. But TAPR's name doesn't appear on top, just down somewhere in the credits. TAPR had no more say than anyone else in the direction the project took.

TAPR is looking for similar ways to help turn a little money and hard work into benefit for the packet community at large. If you have a hot project, but it's on the back burner because you can't afford (or find) a particular part, or you have one done and would like help documenting and distributing it worldwide, contact TAPR at PO Box 22888, Tucson AZ 85734.

The TAPR meetings usually attract the leading edge of packet developers. Among those present were W0RLI of BBS fame, KA9Q of TCP/IP fame, and W6IXU of NETROM fame.

An interesting non-human attendee was the world's smallest TNC-2. Built by the Packet Radio User's Group club in Japan, it consisted of two boards, each two inches by three inches. The

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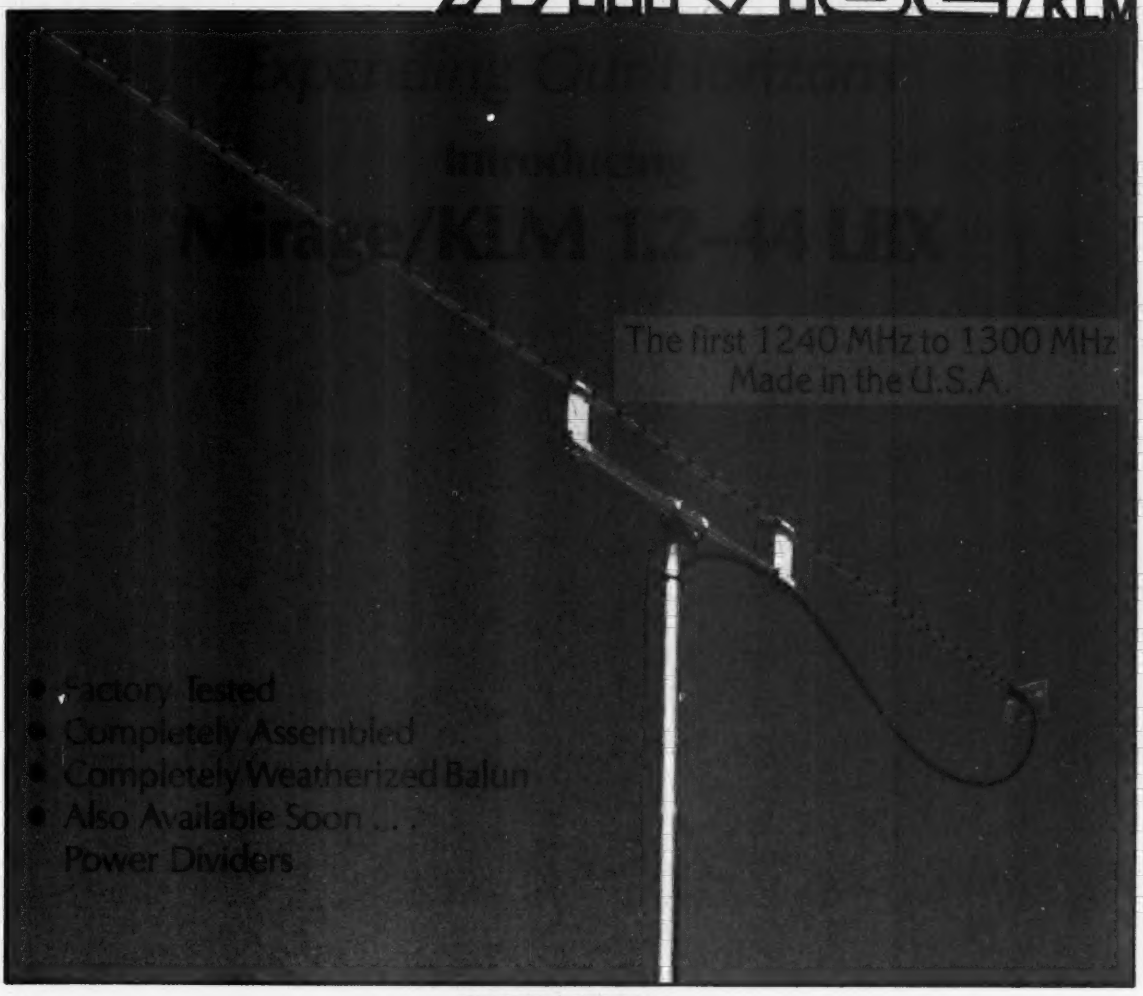
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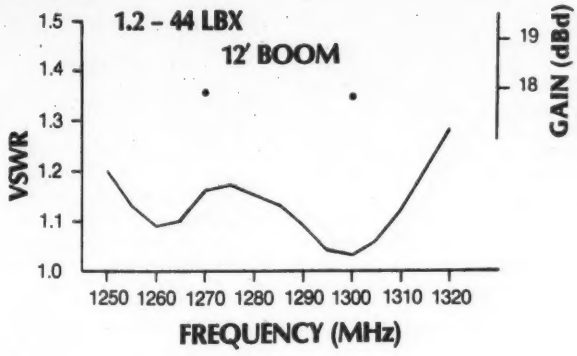

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boards were four-layer and were built using surface-mount technology. The board was all CMOS and included all the elements of a standard TNC-2. The TNC-2 software ROM was in a surface-mount socket. The boards mounted less than 1" apart. I have little doubt that you could take the electronics from one of the shirt-pocket HTs and place it and the PRUG TNC-2 in a standard HT volume.

Also present was the world's most expensive TNC-2—the "Tempest" TNC, being shown by Al Danis K6HGF from Hadron, Inc. Tempest is a government standard for shielding a device like a computer so that rf generated by the computer is not radiated. This is not for TVI protection, but rather to keep the data from being "broadcast" and detected by the bad guys.

This shielding, and the cost of getting the shielding certified, is expensive. The Tempest TNC, with its forward error correction feature and its suitability for connection to an external encryption device, sells for $5,000. Compared to other similar devices, this is cheap.

Their TNC has been on Air Force One and has been used for White House communications. It has been used in other high-level government applications; about 200 are already in the field.

The major features of the TNC-2 that make it useful in this application are the automatic retry of unacknowledged data and format of the transmitted data. A side effect of the way we send data is that asynchronous (start/stop mode) data from a terminal is translated into a continuous bit-synchronous data stream. The synchronous data is more suitable for certain types of data-encryption devices.

Al pointed out that here was an example of a project in which as much as $1 million in development costs had been saved by using technology that amateur radio operators had developed. Several of the audience members expressed a wish that this information would find its way to the FCC for the 220 docket.

A FEW STATS

As usual, I'm out of space but have more to say. WB6YMH and I are working on a statistics-gathering system for packet in our area. A preliminary run showed that 2.6 million characters were sent on 145.36 in the LA area during the 24-hour period ending Sunday morning 3/8/87. Not counting transmitter key-up delay (i.e., just the character transmission time), that's 299 minutes used, or about 20% channel utilization. Packets were heard from 81 different stations—145.36 is a BBS frequency.

On 145.01, during the following 24 hours, 1.3 million characters were heard from 196 stations. This is not as predominantly BBS as 145.36.

There are eight frequencies in active use in this area. We're going to gather stats on all of them. More on this topic next month.■

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

PIRACY ON THE HERTZIAN WAVES

Well, yo-ho-ho. Shiver me timbers and avast ye transmissions, matey! 'Tis time to talk about a subject near and dear to all hams' hearts—radio piracy.

Who among us has not, at one point or another, contemplated the pleasures of running an illicit radio station? Who among us has never "accidentally" slipped his vfo into a subband reserved for the exclusive use of higher-class licensees? Who among us can look into the mirror each and every morning, with a face covered by Gillette Foamy, and say, "I am truly an honest and law-abiding ham"? Judging from the people I know, not very many.

Radio bootlegging and piracy (there's a subtle difference between these two arts, but don't ask me to explain it) are the deep and dirty little secrets of our hobby. Most hams are like the minister who preaches sobriety from the pulpit, but sips glasses of sherry in the study. "Kill those damn bootleggers," shout the pious, who then go and dabble in some foreign territory DX. Yum!

I think piracy and bootlegging are especially rampant among our callow youth, what's left of 'em. Kids, not seeing any sense in learning that silly binary code we force down the throats of potential inductees, prefer the easy way out and award themselves their own tickets. And with the FCC and ARRL being what they are these days (shambles?), they know the chances of being caught are exceedingly slim.

Now, don't get me wrong. I'm not endorsing any of this; nor am I waving a disapproving finger. Being a fair-minded journalist, I'm merely pointing out that such activity exists, and these days probably in unprecedented numbers.

"Who among us can look into the mirror each and every morning, with a face covered by Gillette Foamy, and say, 'I am truly an honest and law-abiding ham'?"

Actually, some of my best friends have been bootleggers. For instance, back in the late 70s, I knew Tom, a computer science major at a leading Long Island university. Tom, like most radio pirates, had a bit of an ego problem in that he loved the sound of his own voice more than anything else in the world. His school had a campus FM station, but Tom preferred running his own show. He never much bothered with the crowd that congregated at the school's station, for Tom had what was probably the most foolproof scheme ever devised for running a bootleg station.

Broadcast bootleggers face a strange paradox. On the one hand, they want their signals to be heard far and wide. The more attention they gather, the better. On the other hand, they don't want to attract so much attention that they invite a visit from the guys in the truck with the funny antennas. And therein existed the beauty of Tom's scheme.

"The idea is to go on the air only during raging snowstorms," Tom told me at the time. "That way, the FCC isn't going to be able to track you down. No four-wheel drive for the candy company, right? Besides, the rotten weather gives you a captive audience." Tom was a broadcasting genius.

So, two or three times every winter, WONS ("snow" spelled backwards) would hit the stormy air. And it was a fine station. Great classic rock mixed in with snappy chatter, frequent time checks, and well-prepared news reports were WONS trademarks. Heck, the station even provided weather and traffic reports for those stuck in the elements.

Unlike most bootleg operators, Tom was smart enough not to wear out his welcome. WONS remained on the air only as long as the flakes were falling, and the entire operation was disbanded after a few winters. "I grew up," the pirate's pirate told me recently. Grown up, but certainly not forgotten.

Unfortunately, as far as radio pirates go, Tom was a rare and intelligent exception. Most bootleg stations I've heard recently are of an astonishingly poor caliber. Lousy music, lousy talk, and lousy signal quality are hallmarks of the pirate stations of the 80s.

What on earth has happened to the broadcast pirate? Drugs? Booze? Heavy metal? Morse code? Darned if I know. The main problem is that these newcomers are committing the pirate's most unpardonable sin—they're boring.

The ham radio pirate scene isn't much brighter. Pirates on our own bands consist primarily of Colombian drug traders, wealthy sea-going air-heads, and those famous South American Bible traffickers ("The psalms are on the way, Jose!"). On the whole, a pretty sordid lot.

I think it's up to the FCC and ARRL to clean up this mess. It's time we urged the mighty powers in Washington and Newington to get us a better class of pirates. Perhaps we could ask the Feds to set aside a portion of one of our more useless bands (20 meters?) for the exclusive use of bootleggers. Direct competition may be just the ticket to improve the quality of these stations.

On the other hand, maybe we should just ship 'em all to Siberia, a place with lots of WONS.■

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ALMOST ATHOS

In August of last year, four Italian DXers failed in their attempt to stage a major DXpedition from Mt. Athos. Thanks to Tony Privitera IØIJ for furnishing the information for this report. Mount Athos SV/A lies at the tip of a rocky peninsula in northeastern Greece. More than a thousand monks live on the Holy Mountain, with little electricity and with only donkeys for transportation. The town can be reached only by ferry boat. Women, long hair, musical instruments, smoking, dogs, whistling, and movie cameras are prohibited. The country has been very rare on the ham bands in recent years, due to the reluctance of the monks to issue permission for visiting amateurs. What few operations have made contacts from Mt. Athos have been surrounded by controversy. The latest attempt to activate Mt. Athos was no exception.

Propagation Study

The Italian "Almost Athos" DXpedition began with a proposal from Prof. Meo Furino IØER to the University of Palermo to do a study of ionospheric propagation. His idea was to make a bunch of radio contacts at the bottom of the sunspot cycle in order to map changes in the ionosphere. Meo and other Italian amateurs proposed that the investigation be conducted from a spot remote from sources of man-made electrical interference, a spot surrounded by water, and one not too near the tropics. "After careful examination and evaluation, we have reached the conclusion that only the Halkidiki Peninsula, at its extremity of Mount Athos, can guarantee good statistical data," the proposal read!

Although labeled a "scientific expedition," the group's proposal specifically mentioned operation on amateur frequencies from 160 meters through 432 MHz, and "exchange of radio signal strengths and levels of comprehension." In other words, a signal report. There was no question that this was a DXpedition, although that word does not appear in the proposal. The proposal also suggests operation from the top of the mountain, 7 km from the nearest monastery, to avoid disturbing the "spirituality and the ascetic life" of the monks.

The group's proposal won favor with the University of Palermo. And, with the official backing of the university, the Italian amateurs started assembling the necessary permits from Greece and Mt. Athos.

The Greek Ministry of Transport and Telecommunications issued a temporary permit to operate a radio amateur station to IØER, IØDUD, IØGPY, and IØIJ. Then on July 1, 1986, the Ministry of Foreign Affairs granted permission for the operation. The only remaining stumbling block was the written permission from the Holy Community that runs Mt. Athos. The monks had always been very reluctant to issue such permission, and more than one prominent DXer walked away from Mt. Athos without written authorization from the monks.

The Monks Agree

This much-coveted document finally arrived on July 29 (only two weeks before the planned starting date). The Holy Synod authorized "entry into Mt. Athos with your vehicle, to utilize the agreed frequencies." [All frequencies listed were amateur allocations.] They had it! Written permission to conduct a DXpedition on Mt. Athos! The last hurdle surmounted, the DXpedition was on. Or so they thought.

While waiting for official permission from the Greek authorities, Meo invited a Greek Mt. Athos DXpedition veteran to join the trip. Manos SV1IW had operated /SV/A in 1980–81, but this time he balked at the 1/8 share of the costs he was asked to provide. As a final courtesy to the local amateurs, Meo wrote to the president of the Greek amateur radio society, the RAAG, describing the operation. Meo sent this letter on the same day he got the final permission from the monks, so he made an honest effort to keep the Greeks informed.

With time running short, the Italians started packing their van with more than 3,500 pounds of gear, including camping equipment and food, nine transceivers and their linears, monobanders and crank-up towers, wire, and three electrical generators.

The Greeks Intervene

Within a matter of days, the months of careful preparations began to unravel. The local Greek amateurs, still hot under the collar about the disputed Mt. Athos operation by Frank Turek DK7FT earlier in the year, felt that the Italians obtained their Mt. Athos operating permission by fraudulent means. Almost as soon as the Greeks received Meo's letter explaining the Italians' plans, RAAG members were arguing in front of government officials that the Italians were out for pecuniary gain and personal glory, and not scientific progress.

The tactic worked, and on August 4, only three days before the team was scheduled to drive to Mt. Athos, the Italian Embassy in Athens received an official note prohibiting all radio "emissions" from Mt. Athos, and specifically those on any amateur frequency.

The reason given for the revocation of the previously granted permission was concern that the operation should be for "the progress of Science and the good of Humanity and not for a profit or personal interest."

Pino IØDUD immediately flew to Athens to try to mend the broken fences and regain their hard-won permission. Through the help of the Italian Embassy, he was able to meet some low-level officials, and based upon this progress, the rest of the team left Rome on August 8.

Pino's efforts to reach decision-level officials failed, however, and the Ministry of Transport and Telecommunications modified the Italians' operating permit to specifically exclude Mt. Athos. "Activity from Mt. Athos must be limited only by listening to radio messages." The Ministry further restricted the Italian license by stating that representatives of RAAG be present at all amateur operations.

The van with all the equipment arrived after its long drive and ferry trip, and the Italians elected to set up their station near Ouranopolis, only 3/4 mile from the Mt. Athos border (see Photo B). IØIJ/SV made a few contacts from this spot, but eventually the operation ceased, and the crew headed back to Italy, having spent more than $12,000 in their unsuc-

Photo A. Tony IØIJ operating /SV only 3/4 mile from Mt. Athos (photo by IØER).

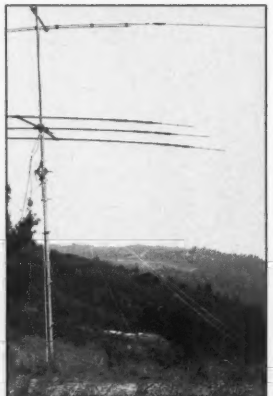

Photo B. A tribander and a 2-element, 40-meter beam look out over Mt. Athos SV/A (photo by IØER).

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cessful attempt to activate Mt. Athos.

Interestingly, the Italians did visit Mt. Athos, but without their radios. Along with unfruitful attempts to get permission to operate, the Italians used the opportunity to check the Mt. Athos files. They were looking for the file copy of the permission Manos SV1IW received when he operated from Mt. Athos. Msgr. Damaskinos, General Secretary of the Holy Epistasy, stated that Manos' permission was a fake, and there was no file with such a serial number!

This could mean that the Mt. Athos filing system leaves something to be desired or that one of the few accredited operations from Mt. Athos was, in fact, illegal. Further, the monks suggested that they thought radio amateurs were a constant source of irritation into their quiet lives, and that the hams were in it for the money. The latter was based on numerous missent QSLs, many containing Green Stamps (U.S. $1 bill).

This latest episode will not encourage the monks to grant amateur radio permission soon. The obvious infighting among the hams and the accusations of financial gain backed up by the missent QSLs provide powerful incentives to continue to prohibit amateur radio operation on Mt. Athos. The Greeks have dealt a death blow to their own chances of operating from Athos with this attack on the Italian DXpedition.

There is one ray of hope, however. A resident monk has been taking a 60-mile ferry ride each week to study for his amateur radio license. Unfortunately, the monk did not show up for the test last fall; maybe he'll try again this spring. Even if he gets his license, however, he will still need permission from the Holy Community to operate from Athos. Only time will tell.■

QRP

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

THE 6L6 SPECIAL

Since I started doing this column in October, many of you have asked for small projects to build. This time I have a real treat for all the readers who like the smell of molten solder. But before I get things started, I'll give you some history. The project this month is a little rig I call the "6L6 Special." In a past column I made mention that I use a small 6L6 transmitter from time to time. Well, there was quite a bit of interest in my little rig. So much, in fact, that I got tired of running down to the quick print shop for copies of the schematic.

A Bit of History

Now for the history lesson. Looking back to 1986, there was one small anniversary that went unnoticed to most of the world. The 6L6 turned 50 years old.

As years go, 1936 was a lot better than most. The electronics world was just starting to cook. The country was slowly coming out of the Great Depression. General Electric Company, in 1935, developed the idea of a metal receiving tube. RCA was licensed to produce these tubes for the home market.

At the same time, RCA was busy working on a revolutionary tube design that would offer high power, high gain, and low signal distortion—with lots of output power. Between RCA and General Electric, it seemed natural to incorporate this new concept in the newly developed metal envelope. After the smoke cleared, the 6L6 was born in the spring of 1936.

The tube was designed for audio use, but it could crank out more than 35 Watts of power when used as a crystal oscillator. However, the metal tube was not the answer to the world's troubles. Seemed no one really knew what to do with the metal envelope—leave it float or ground it. Later on, RCA redesigned the tube, using a glass envelope. This glass tube was named 6L6G. Then RCA moved the plate connection to the top of the tube and the 807 was born.

The 807 was a real rock-crusher. Running an 807 with 600 volts on the plate could turn out 60 Watts input all day long. But the days of the 807 were numbered; it was to be replaced by the 6146. However, the 6L6 was given a new life in the world of television as the 6LQ6, a horizontal output tube.

The 6LQ6 was used in several designs for kW ham amplifiers. Running 1,100 volts on the plate, these tubes would just scream! Output power was nearly 800 Watts. I wonder how they kept them in their sockets.

The 6L6, now called the 6L6GC, was revived for hi-fi audio use and is still in use in this market. Not bad for an idea that was started 50 years ago.

Early Stages of the 6L6 Special

As a dare from the local radio club, I built a 6L6 transmitter from an old *QST* article written by Fred Sutter W8QBW in 1939. The article was one from the QSL series transmitter that W8QBW designed. Using one 6L6, it had an output of about 40 Watts. Photo A shows my small creation. The transmitter was built in about three hours. It worked, sort of.

Jerry Felts NR5A/Ø read about my little circuit and sent in his version. I modified it again and the result is shown in Fig. 1. A 6L6 crystal-controlled oscillator is the basic circuit. I changed the output circuit by using a pi-network. Also, I added a voltage divider to help keep the screen voltage stable during key-down. The final design is shown in Photo B.

I used an 8″ x 10″ x 3″ aluminum chassis for the transmitter. It makes it rather nice to be able to go inside the chassis and wire up a project for a change. You will notice a second tube on the same chassis. More on that one later.

Scouring the Junk Box

Dig up the soldering "gun" and the chassis punches. We're going to build a radio. Before the drill meets the metal, you should have all the parts on hand. If you have been following these columns,

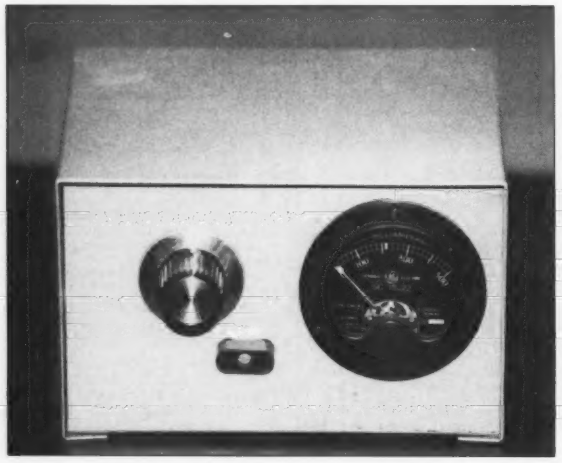

Photo A. My first 6L6 transmitter installed in a box the size of a QSL card.

Photo B. Here it is, the 6L6 Special. A crystal-controlled 6L6 transmitter. Output of 12 Watts on 80 meters.

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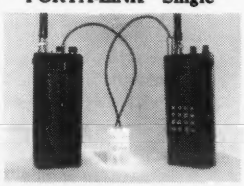

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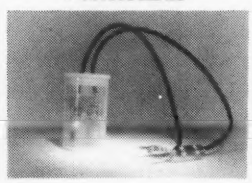

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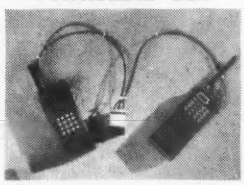

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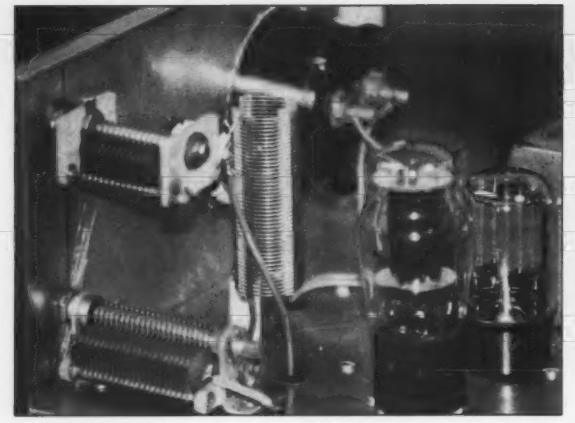

Photo C. Pi-network of the transmitter. The large tube is the 6L6, while the smaller one is the 5U4.

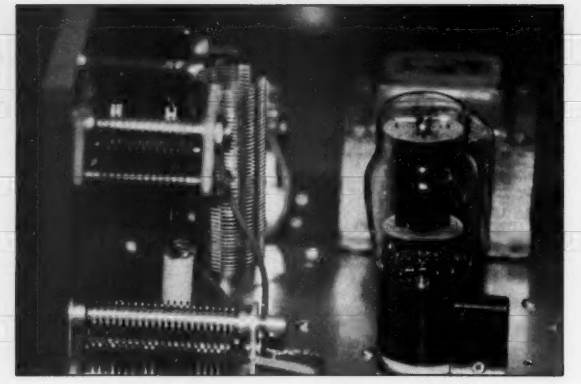

Photo D. Mounting details of the pi-network.

you'll remember that I have never yet been stopped by lack of parts. This project will be the test of part procurement.

My junk box yielded only a small amount of what I needed. I had to turn my shopping list over to Perry W8AU, who is locally known as "Father Radio." Rumor has it that, as a young boy, Perry helped Marconi wire up his antennas. A strong denial comes from him on that subject. However, he was able to pull out from his junk box all the parts needed for the transmitter.

To call Perry's junk box a mere junk box is like calling the *QE2* a boat! Perry has the only three-floor walk-in junk box I know of. Ann, Perry's wife, is always glad to see me with my shopping list, as I always leave with a handful of parts. That opens up a few empty holes on the shelves, which Perry promptly fills back up. A sincere "thank you," Perry.

The circuit is built using point-to-point wiring. Small terminal strips hold the components. Rf runs were done with RG-58/U cable. At this power level, RG-174 could be used also. Pay close attention to the voltage rating of the parts. We are not working on solid state here.

This brings up a very important point. *Use caution when working on this transmitter. Lethal voltages are present when the line cord is plugged in. Discharge all power-supply capacitors before working on this unit. Use common sense.* It sure is no fun to get zapped with 450 volts.

While I used the chassis that was on hand, feel free to use a smaller or larger chassis. I put the plate supply on the same chassis. It need not be so; you could place the supply in a second chassis and use a cord to connect the two units together.

I used a 5U4 as a rectifier for the plate supply. Why did I do that? Well, I was a driven man; I wanted to. Fig. 2 shows the power supply that is in my unit. Sure, it's fine to use solid-state rectifiers for the supply; you'll miss the warm glow of the 5U4, though. My junk box supplied a dual-section capacitor for the supply. It is 40 uF at 550 volts. A 12-henry choke at 80 mA helps smooth out the output from the 5U4. Under no-load conditions, the supply runs 450 volts. At key-down the voltage falls to 412 volts.

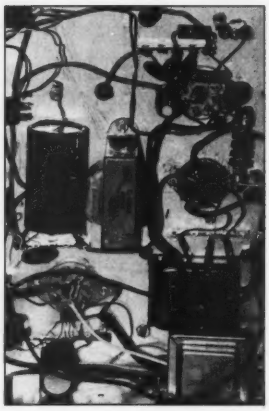

Photo E. Close-up of the chassis. Low-voltage supply mounted on the edge of the chassis.

At this time you may notice that I have not included a parts list for the transmitter. You have to use what you have on hand. For example, the plate transformer I used is a one-shot critter. If it goes up in smoke, I'll never be able to get another one.

The coil used in the pi-network came from Perry's junk box. Looks like 48 turns, 1 inch in diameter, 3 inches long. Tapped about halfway for 40 meters.

Making Adjustments

After the supply is built and tested, finish up with the oscillator circuit. Double-check your work for errors before plugging in the unit. Then plug it in and turn it on. After allowing it to warm up for a few minutes, install a crystal and key the unit up. Quickly adjust the tune capacitor for a dip in plate current. Adjust the load capacitor for an increase in current. Again, re-dip the oscillator. You should see about 12 Watts output on 80 meters and somewhere near 10 Watts on 40 meters.

While listening on a receiver, retune the oscillator for the best-sounding CW tone. Remember all you have here is an oscillator; trying to get too much power out will cause the transmitter to chirp. Using Ohm's Law (remember him), I calculated the input power to be 24.3 Watts. So, I have about 51% efficiency, which is not too bad.

The loading capacitor is a bit small on 80 meters and will not load the unit very heavy. If you have crystals for 160 meters, you will have to change the coil in the pi-network and increase the values of both capacitors.

While I'm on the subject of the pi-network, be sure to include the

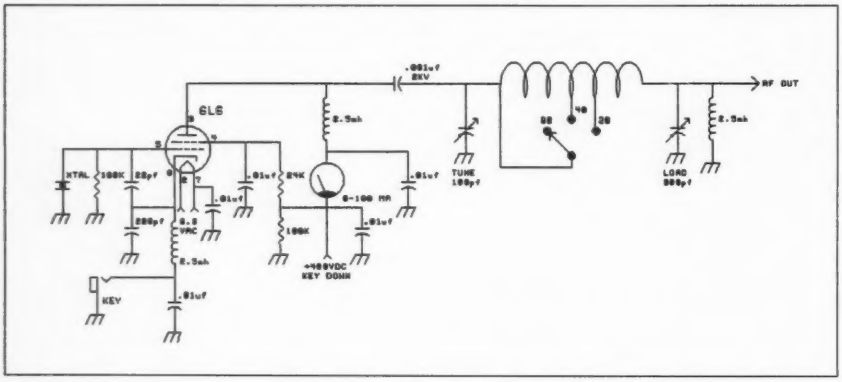

Fig. 1. Schematic of the 6L6 Special.

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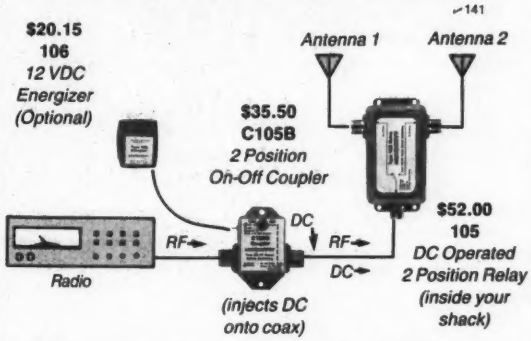

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rf choke on the output. Should the coupling capacitor short, the choke will short the plate supply to ground, blowing the fuse and thus keeping the plate supply voltage off the antenna.

A Challenge

That's about it. I built the unit shown in the photographs in about three evenings. Most of the time was for the metal work on the chassis.

I use an old Collins 75A4 for a receiver when I use the unit. To keep from having to throw a dozen switches to go from transmit to receive, I installed an antenna relay to move the antenna and mute the receiver. The relay that I used requires 12 volts to operate, so I built a small 12-volt supply into the transmitter. A front-mounted switch operated the relay. Nothing hi-tech, but it works fine.

I hope this transmitter has your interest piqued. To hang a carrot down in front of your nose, I'm going to be running a small contest. Here goes. Build your own version of the 6L6 special and work all 50 states using a tube that's 50 years old.

Sounds easy, doesn't it? Ah yes, there is a kicker (actually several). Number 1: Your transmitter must be crystal-controlled, using no more than five crystals per band. Number 2: You must send in a photograph of your completed unit. Number 3: No contacts are allowed before May 1, 1987. Number 4: Power must be no greater than 10 Watts output.

Contacts may be on all bands. However, Official Observer reports will not count as states worked! I think after you hit 20 meters, you'll have a real chirper! Photocopies of QSL cards or a signed statement from you and your local club officers will be fine for the award.

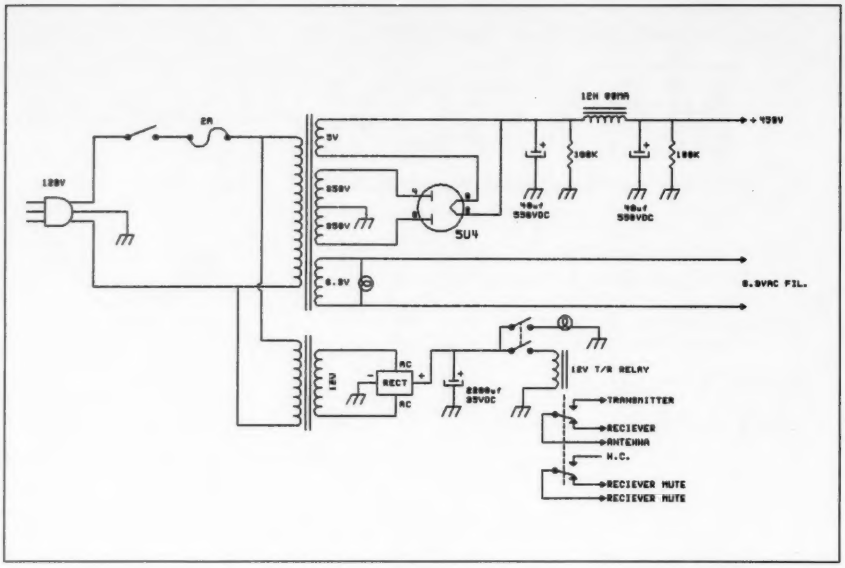

Fig. 2. Schematic of the high-voltage power supply and the low-voltage supply. Relay is used for receiver muting and antenna switching.

Oh my, I forgot to tell you about the award. I will make available to all builders a special QRP Worked All States Award for using the 6L6 Special. You can work your way up to all 50 states with stickers for 30, 40, 45, and 50 states. The QRP ARCI will handle the awards via me. As a special bonus, I'll keep an up-to-date list here in the QRP column for all the world to see. So, do I have any takers?

Keep sending your comments, letters, and photos to me. I always enjoy reading your activities in QRP operation and plan to print up as much as I can.

That's about all the space this month. Even if you don't build the 6L6 special, that's how the hams of yesterday did things. One can learn a lot from the past, because when you get right down to it, that ham ticket is but a license to learn. ■

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

INTERVIEW WITH A LEGEND: PART II

Last month I began an introduction of the one individual most responsible for the repeaters that you and I both enjoy daily. His name is Arthur M. Gentry W6MEP, and in the 1950s he put on the air what was to become the grandfather of the modern amateur repeater. I covered the development of relay technology in the southwest, the emergence of Art's K6MYK repeater, and the eventual shift to FM in repeater operation. But, the story of W6MEP's involvement in the development of the concept of relay communication does not end there. I'll pick up my interview with Art by asking about the offspring that his first repeater spawned.

73: It's well-known here in California that K6MYK kind of fathered a number of other repeaters. Tell us about this . . . how about the very famous WA6TDD?

Gentry: As you know, the WA6TDD repeater was one of them. I guess it came about after Burt Weiner K6OQK came to live with us. [*Note: Art and his wife Millie K6JJN have provided homes for many children over the years. Many had a thirst for the kind of knowledge that only an Art Gentry could supply. Art and Millie are a pair of warm-hearted people with a love for humanity. In their own way, they have both dedicated their lives to serving it.*]

Burt had known me a long time . . . from when he used to come over to the TV station. After he was here, he decided that he was going to have a repeater. He literally built a copy of K6MYK. Many things were identical . . . like the same type of control system . . . but he improved on it because we would sit and discuss it. I guess I feel like the grandfather of his machine. He in turn got a remote-control license for the original site on Mt. Wilson, and we have cooperated over the years to this day. WA6TDD was born right here in this garage!

73: This brings us to something else peculiar to southern California. Simplex . . . specifically 146.76 simplex. There have been many stories about .76 over the years. Can you help separate some of the fact from the fantasy?

Gentry: FM in southern California really started on 146.76 MHz, which was simplex. And .76 developed into a very avid simplex channel. For some, it became a way of life in the same way that 145.35 was a way of life in the old AM days. Much the same way that the repeaters are today. There is a personality, a character to each channel . . . whether it's a repeater pair or a simplex channel. So .76 developed along these lines. A lot of its users were converts from the AM group to FM, and that was the frequency to use.

73: Did .76 actually become a society of its own?

Gentry: Yes it did, but .35 was the same way. The old .35 group on AM would get together for parties and T-hunts. I was a hunt-master and a member of that group as well as being involved in repeater activities. It was sort of a combo group. This was the "simplex channel" that the repeater people went over to; .76 simplex is still that way.

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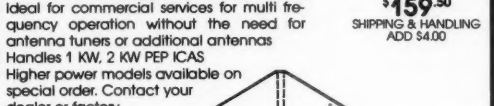

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73: Is that why there has never been a successful wide-area .16/.76 repeater in Los Angeles?

Gentry: This is because of the traditions involved. Even today you will hear people say, "I've been on .76 since the day it opened and I think that I have a right to stay there." That's the way that they feel.

Now, because of the then overpopulation on .76, the early FMers needed to go somewhere else. I think that people next went to .94 because it was one of the standard "60-kHz channels." I wasn't involved in choosing that frequency, and I don't remember all the details. But, a great many of the commercial FM people became involved in .94, and at this point many of the famed pioneer California remote-bases were born. So, .94 became the de facto channel of those people who wanted to operate remote-controlled stations.

This brought on a kind of "competition" between the two modes of operation...that is, simplex versus remote base. If the remotes came onto .76, the .76ers would jam them. If the .76ers showed up on .94, the remotes would do the same. Actually, it was nothing more than the two groups trying to settle their differences and run their operations without interference. Through the years, people learned to negotiate and it was all settled pretty well.

73: Even though you yourself were already a repeater and remote-base owner, didn't you eventually become the spokesman for 2-meter FM simplex to the California repeater world?

Gentry: Sometime in the early 1960s, the old California Amateur Relay Council (referred to as CARC) was born. The owners of all repeaters and remote-bases were invited to join. Most of them did, and I was a member of that council for a good many years. They held meetings all over the state. But, I think this was really the beginning of any sort of organized voluntary frequency coordination in the nation. At least it was in California.

In southern California, this was definitely the beginning of any type of coordination... through the southern California representatives to the council. Southern California had not yet gone for all-band coordination at the time as a general rule. Oh, they had on 450 MHz...early...long before coordination anywhere else...because with the growth of remote-bases came the need to have interference-free channels.

Also, another aspect that many may not understand is a concept...one that says that while I might not have a transmitter on the air every moment of the day, that channel pair is still busy. This pair is busy right now. It's busy monitoring the downlink, and if I turn the link on, I need a clear channel.

People have said that they can tune across the entire 450-MHz band and never hear anything. That's true, but only because they don't know where to listen or what's really going on a given channel or what a given channel pair is used for. I think that in the future, the privilege of that type of spectrum usage has to be protected because there will come a time when uninformed people may say that there is nothing on this or that channel pair...and I or my system is going to use it. If that were to happen and if I found that I could no longer control my repeater, I would be forced to shut it down.

73: How does a repeater owner handle a situation like this?

Gentry: This is something that has to be explained and written about at every opportunity. It's a matter of education, of explaining that some of this stuff does not come easily.

People put out a lot of time and money to make repeaters possible. In my opinion, we have to get through to the ARRL and through them to the FCC and make them understand that there is a need for a band that is exclusively for control systems. Repeater owners need some protection in the FCC rules so that when the average amateur goes out and purchases a new piece of equipment he knows that there is a section of the band that he cannot use.

A lot of 2-meter machines are now controlled on 220 MHz. Think of the chaos that can occur if 220 gets as busy as 2 meters is now! I feel quite strongly that this may well happen, and if I were a much younger man, I would be in there fighting or doing what I can.

73: You have done a lot of fighting for other people over the years. You helped to open repeater councils here in California to users as well as repeater owners. Why?

Gentry: Let's say this. I am a repeater owner, but way back in the beginning I felt that everybody should be able to use a repeater. Why should it be exclusive?

It's fine if somebody wants to have it private. I have my own private system on UHF in addition to the open 2-meter machine, but this does not mean that I do not strongly believe in open-channel operation. I've had many battles with other hams who claim that open-channel machines are no good. Well, in a sense of the word, they are plagued with problems, but I am hoping to find solutions! I have no idea what they may be, but I do know that they will come from a better education of users. When users know and understand better...when we get rules and regulations that help us to police our bands...then.

"The next time you key up your favorite system, you might want to pause a moment and give thanks to the man who made it all possible."

The FCC says that we are self-policing. That's the wrong terminology. We are not self-policing. We have no police powers. The FCC does not give us any. Rather, we are self-regulating. We help set our own rules. And, we can enforce our rules, but we cannot police. That's the FCC's responsibility.

But back to the question...I think that we can date the start of the change to when Bob Thornburg WB6JPI became president of the old Southern California Repeater Association...the SCRA. [*Note: When the CARC was dissolved, though not disbanded, it gave birth to three offspring of its own. One was the Northern Amateur Relay Council. In the south, the Southern California Repeater Association and the Southern California Repeater and Remote Base Association took root. SCRA coordinated 2 meters and 1-1/4 meters until 1979, when it gave way to the current 2-meter and 1-1/4-meter spectrum management associations: TASMA and 220-SMA.*] By this time the SCRA's repeater owner membership was very small. Possibly because the SCRA had gotten involved in a battle over .76 simplex and a repeater that wanted to use the .16/.76 pair. In reality, they had no way to go except to get in and fight, and I must say that they did an admirable job. However, that had an adverse effect, since here was a group of repeater owners involved in a big dispute that, in reality, they didn't want to be involved in. That probably drove away a part of the membership.

Anyhow, before that I had become the representative of the simplex people to the SCRA, and I took the floor at the very first meeting and tried to state that the organization had to think about all users of 2 meters...and, I was sort of laughed at because everyone there was a repeater owner. So many of them had not yet learned that the power lies in the multitude of the people. You see, each time a new station comes onto an open-channel repeater, there is a vote of approval for that repeater, for its use of that pair of frequencies. Therein lies the seat of power, if you will, in the whole matter of voluntary frequency coordination.

73: Art, here's a real sticky one. Do repeater owners then fear their users?

Gentry: Let me answer it this way. Probably the basic attitude of nearly everyone who gets involved with putting up a repeater—be it an individual or a small group—is that they know their problems; they want to solve their problems and do not want to look elsewhere. Many don't accept outside help; many lose sight of the fact that they are using a pair of frequencies that everyone else is entitled to use. It's only by the grace of all the users of the band that repeater owners can have a pair of frequencies that are dedicated to a repeater.

73: What about the future?

Gentry: I sincerely hope that more of the users become involved in organizations such as TASMA, 220-SMA, and the like, and that they will become better educated about the problems we all have regarding what it takes to run a repeater.

You can hear new people come on the air every day. They walk into a radio store and a guy sells them something. But, nobody ever tells him what the score is or the responsibilities that come with

that new radio. Again, this is a place where the ARRL and the other ham magazines should step in. Somebody is going to have to step into this void and take the lead. I've been an ARRL member since 1938, and I wish that they would do it.

I guess I believe that somebody could step in and become the champion of all of these people and educate them. Possibly, this is the next step for our repeater and spectrum management groups. It's analogous to buying a boat and then learning to sail it through proper instruction or getting a driver's license to take a car on the street or freeway. We do this for our own personal protection and that of society. It's the same for repeaters. There has to be this education, or all of these people who have gone out and bought channelized radios could eventually be left holding the bag for a lot of equipment that they have purchased, but that might be unusable if chaos breaks out.

What you have read the past two months is an abbreviated version of more than two hours of a tape-recorded interview with amateur repeater pioneer Art Gentry W6MEP and numerous other conversations between us over the years. I have tried to keep from paraphrasing Art's responses, although some were very long and required editing to be included in this mini-series. I sincerely hope that you enjoyed meeting the man who definitely deserves the title of "Grandfather of the Modern Amateur Repeater."

I consider myself very lucky to be able to call Art a personal friend, a man who made me welcome on the radio almost on the day I moved to Los Angeles many years ago. I only hope that some day our great service will see fit to bestow on W6MEP the accolades he deserves.

In the meantime, the next time you key up your favorite system, you might want to pause a moment and give thanks to the man who made it all possible. Or, better yet, look up W6MEP in the Callbook *and drop him a QSL card that expresses your appreciation.*

And, for this month, that's it from those of us who work and write the late shift in the City of Angels. ■

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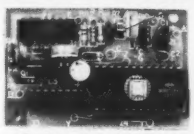

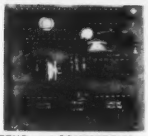

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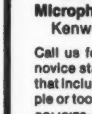

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Call us for advice in choosing equipment and putting together a complete novice station to meet all your needs. We can make a "package" deal for you that includes everything you will need from the ground up. No question too simple or too complicated for your friends at Madison.

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HAMSATS

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

IT WORKS!

How about a two-way packet QSO with West Germany using VHF and UHF and only one packet digipeater? It's been done!

In last month's column, I had nothing new to report on mode JD (digital), but since then things have changed drastically. The digital mode on Fuji-OSCAR 12 has been activated with many firsts occurring both here and overseas.

On February 24th, Peter DB2OS in Hannover, West Germany, found the JD transmitter active with PSK (phase-shift keyed) telemetry. He tested one of the four 2-meter uplink frequencies and then connected to himself via the satellite.

News of this success spread. On the 26th, at 2000 UTC, the first successful West Germany to Belgium JD QSO occurred with DB2OS and Freddy ON6UG. The contact was relatively short, but there was enough time to exchange names, QTHs, and regards, and to marvel at the quality of the connection between Hannover and Ghent. A little over three hours later, the first stateside JD contact took place.

On FO-12 orbit number 2466, I found the JD transponder not only ON, but loud with the 435.910-MHz (SSB/PSK) beacon sending telemetry. (An earlier example of FO-12 telemetry can be seen in the February HAMSATS column; the PSK packet modem designed by Jim G3RUH was shown in the March issue.) After verifying that the tape recorder was running and the computer was ready, I tuned up the 2-meter transmitter on 145.890 MHz (FM/PSK) and tried to connect.

It worked! After a few path tests, Ed KA9LNV connected to my station, and the first U.S. digital Fuji QSO commenced.

I was quite surprised to find anyone on JD, but also delighted to make contact. Ed had connected to himself on a pass earlier in the day and was just waiting for someone else to show up. A portion of our contact is shown in Fig. 1. Note that the conversation is mixed in with the satellite telemetry. This may appear confusing, but actually is not as bad as trying to carry on a terrestrial packet QSO while someone else is accessing a bulletin board on the same frequency.

The system on my end included a Yaesu FT-901 DM for reception, a Yaesu FT-902 DM for transmit, the FTV-901R transverter for 2-meter and 70-cm conversion, and the FV-901 DM synthesized vfo for receiver frequency control. I also had a 2-meter power amplifier, a Hamtronics 70-cm preamp, the G3RUH-style FO-12 modem, a GLB TNC-2A, and my heavily modified TRS-80 Model I computer. The antennas included a KLM 2M-22C for the uplink and a Cushcraft 416TB for the 70-cm downlink.

With KA9LNV up in Columbus, Indiana, things weren't quite as complicated, but the system was quite functional and later yielded some good transatlantic connects. Ed used a Yaesu HT with home-brew amplifier running 30 Watts for the uplink. The receive system incorporated a home-brew GaAsFET preamp to a Microwave Modules 70-cm converter and a Kenwood TS-430S HF rig. Other equipment included the G3RUH modem, a TAPR TNC-2, and a Radio Shack Model 100 computer. The antennas were homemade, with 12 elements on 2 meters and 19 elements on 70 cm.

Two days later, more players were on the scene on both sides of the Atlantic. Over here, Tom Clark W3IWI and Bill WB7QKK were on the air. In Europe, Jim Miller G3RUH and others, including ON1KVH and HB9XJ, had their systems on line with successful JD operation. The first verified transatlantic QSO goes to W3IWI and G3RUH. Close behind were KA9LNV, ON6UG, and DB2OS. Although I have no word yet from Japan, it is likely that activity has been increasing in the Pacific as well.

The Catch

Some have called mode JD a failure since it cannot be operated continuously. The power available from the solar panels is not enough to run the on-board computer, a megabyte of memory, and a 1-Watt transmitter all at the same time. The satellite's 6-Amp-hour battery plays a very important role. During darkness and JD operation, it provides the extra power to the system. Sufficient recharge time must be allowed to avoid dangerously low battery voltage and possible battery damage. An experimental schedule derived for the late-February JD activity included a five-minute on/off cycle imbedded in a two-hour on/off cycle imbedded in a one-day on/off cycle.

On each scheduled JD operating day, the command station in Tokyo would uplink the necessary software to the on-board computer. The computer would remain on even when the transmitter was off until the following day when the satellite would be commanded into recharge mode D.

For one orbit on February 26th, FO-12 was in mode JA, but was later commanded to JD. Passes with short acquisition time and low antenna elevations, as seen from Tokyo, were not used by the command station for satellite software changes. On February 28th, the first good pass apparently was missed, or the programming could not be uplinked. The on-board clock was about two hours, or one orbit, behind.

The most difficult part of the experimental schedule is the five minutes on followed by five minutes off. It is rather difficult to get a good packet conversation going in such a short time. Also, the satellite is not functioning at full potential. The available power will never be enough for continuous bulletin-board-in-the-sky operation.

With rotors to turn, Doppler shift to counter, typing to contend with, and many other items to watch, this JD stuff is hard work. It makes for a great experiment, though. Just working around the several pitfalls has been quite a tantalizing challenge to many prospective JD operators.

What It Takes

To work mode JD, you'll need an FM 2-meter transmit system with 100 Watts erp (effective radiated power). You can do this with 100 Watts to a ground-plane antenna or 10 Watts to a 10-dB-gain beam antenna. Almost any 2-meter-FM rig can be used if it is capable of putting out rf on one of the four available uplink frequencies:

Photo A. Ed KA9LNV, avid satellite chaser, AMSAT supporter, and packet enthusiast.

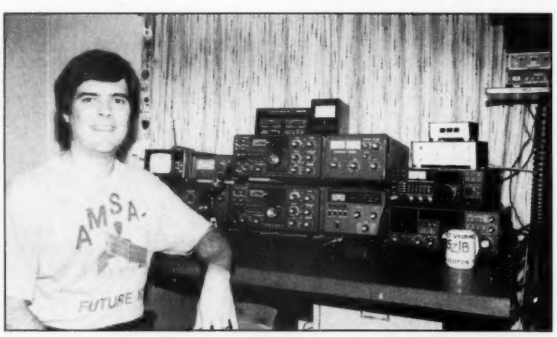

Photo B. WA5ZIB—the other half of the first U.S. Fuji-OSCAR 12 mode-JD QSO with KA9LNV.

IF YOU NEED $5,000 . . . $20,000 EVEN UP TO $500,000 TO START A NEW BUSINESS OR TO EXPAND AN EXISTING FIRM—THEN READ WHY YOU TOO WILL CALL THIS INCREDIBLE MONEY RAISING

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In order to help those people applying for these guaranteed and direct loans fill out their loan applications the "right way" our business researchers, with their diligent compilation and effective efforts, have successfully assembled and published a comprehensive, easy-to-follow seminar manual: The Business Opportunity Seekers' Loans Manual, that will **quickly show you practically everything you'll need to know** to prepare a loan application to get federally Guaranteed and Direct Loans.

Here are just **some of the many important benefits** the Business Opportunity Seekers' Loans Manual provides you with:

- **a completely filled in sample set of actual SBA loan application forms, all properly filled in for you to easily follow—aids you in quickly preparing your own loan application the right way. Each line on the sample application forms is explained and illustrated in easy-to-understand language.**
- **fast application preparation procedures for getting loans for both new start up business ventures and established firms.**
- **advises you on how to properly answer key questions necessary for loan approval and in order to help avoid having your application turned down—gives you advice on what you should not do under any circumstances.**
- **what simple steps you take to guarantee eligibility—no matter if you do not presently qualify.**
- **where you can file your application for fastest processing.**

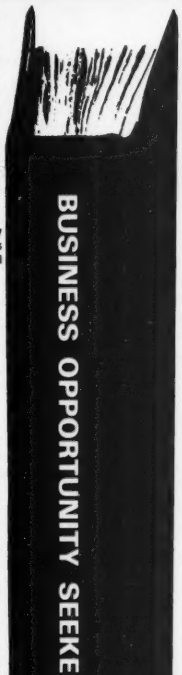
At this point the most important question you want answered is Just where is all this loan money coming from? Incredible as it may sound—these Guaranteed Loans, Direct Loans and Immediate Loans are indeed available right now — from the best, and yet, the most overlooked and frequently the most ignored and sometimes outright ridiculed "made-fun-of" source of ready money fast capital in America — THE UNITED STATES GOVERNMENT

Of course there are those who upon hearing the words "UNITED STATES GOVERNMENT" will instantly freeze up and frown and say

" *only minorities can get small business loan money from the government!*"

Yet on the other hand (and most puzzling) others will rant on and on and on that

" *don't even try, it's just impossible — all those Business Loans Programs are strictly for the Chryslers, the Lockheeds, the big corporations, not for the little guy or small companies*" etc.



Still there are those who declare

" *I need money right now and small business government loans take too darn long. It's impossible to qualify. No one ever gets one of those loans.*"

Or you may hear these comments

" *My accountant's junior assistant says he thinks it might be a waste of my time!*" "*Heck, there's too much worrisome paperwork and red tape to wade through.*"

Frankly — such rantings and ravings are just a lot of "bull" without any real basis — and only serve to clearly show that lack of knowledge . . . misinformation . . . and not quite fully understanding the UNITED STATES GOVERNMENT'S Small Business Administration's (SBA) Programs have unfortunately caused a lot of people to ignore what is without a doubt — not only the most important and generous source of financing for new business start ups and existing business expansions in this country — but of the entire world!

Now that you've heard the "bull" about the United States Government's SBA Loan Program — take a few more moments and read the following facts

- **Only 9.6% of approved loans were actually made to minorites last year**
- **What SBA recognizes as a "small business" actually applies to 97% of all the companies in the nation**
- **Red tape comes about only when the loan application is sent back due to applicant not providing the requested information...or providing the wrong information**
- **The SBA is required by Congress to provide a minimum dollar amount in business loans each fiscal year in order to lawfully comply with strict quotas. (Almost 5 billion this year)**

Yet, despite the millions who miss out — there are still literally thousands of ambitious **men and women nationwide** who are properly applying — being approved — and **obtaining sufficient funds** to either start a new business, a franchise, or buy out or expand an existing one. Mostly they are all just typical Americans with no fancy titles, who used essentially the **same effective know-how** to fill out their applications that you'll find in the Business Opportunity Seekers' Loans Manual.

So don t you dare be shy about applying for and accepting these guaranteed and direct government loans. Curiously enough, the government is actually very much interested in helping you start a business that will make a lot of money. It's to their advantage — the more money you make the more they stand to collect in taxes. In fiscal 1986, our nation's good old generous "uncle" will either lend directly or guarantee **billions of dollars** in loan requests, along with technical assistance and even sales procurement assistance. Remember, **if you don't** apply for these available SBA funds **somebody else certainly will.**

GUARANTEE #1

Simply — look over this most effective money raising loan preparation assistance manual for 15 days — and then, if you are not convinced that it can actually help you obtain the Business Loan you need right away — just return it for a full and prompt refund.

GUARANTEE #2

Even after 15 days — here's how you are still strongly protected — if you decide to keep the manual — and you apply for an SBA Loan anytime within 1 year — your loan must be approved and you must actually receive the funds or your money will be refunded in full.

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Don't lose out — now is the best time to place your order for this comprehensive manual. It is **not sold in stores.** Available only by mail through this ad, directly from **Financial Freedom Co., the exclusive publisher,** at just a small fraction of what it would cost for the services of a private loan advisor or to attend a seminar.

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Therefore, for those purchasing the manual by mail, no 3 day class, no course and accommodations are required. And rather than $450 we could slash the price all the way down to just a mere $20 — a small portion of a typical seminar attendance fee — providing you promptly fill in and mail coupon below with fee while this special "seminar-in-print" manual offer is still available by mail at this relatively low price!

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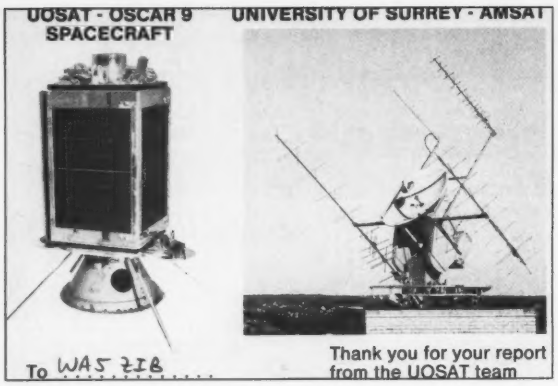

Photo C. UoSAT-OSCAR 9 QSL available from the University of Surrey UoSAT Unit for a reception report.

Photo D. UoSAT-OSCAR 11 QSL, also from the University of Surrey.

145.85, 145.87, 145.89, or 145.91.

For reception a beam antenna would be best but isn't a necessity, since the downlink signal is quite strong. Its "sense" is right-hand circular, the opposite of the analog, or JA, downlink. The two modes share the same receive antenna but have separate transmitters and antennas for the downlinks. I use a simple Hamtronics bipolar preamp in the shack with excellent results, but a GaAsFET preamp at the antenna would be better.

The radio must be capable of SSB reception on 435.910 MHz. The easiest way to do this is with a 70-cm receive converter. Commercially made units are available from Advanced Receiver Research, Hamtronics, and Microwave Modules.

Any good HF receiver or transceiver should complete the downlink system as long as its frequency can be controlled digitally from an external source. Neither of my rigs has this feature. It is necessary to use the external vfo since it uses extensive digital circuitry for tuning. The appropriate up/down control lines were brought out to a connector.

Two basic modem designs have provided the necessary functions for successful JD operation. The first documented design available was introduced by Jim Miller G3RUH. Its construction, calibration, and uses are fully described in the February, 1987, issue of *Ham Radio*. Complete kits are available from Radio Kit, PO Box 973, Pelham NH 03076.

The other design has just recently been announced for sale. It is based on the PSK demodulator by Fujio Yamashita JS1UKR, shown in the August, 1986, issue of *QEX*. The PSK modulator and other circuits by Lyle Johnson WA7GXD of TAPR (the Tucson Area Packet Radio group) and Tom Clark of AMSAT (the Radio Amateur Satellite Corporation) also are integrated into this design. This new TAPR modem will be supplied in kit form, and will include the three PC boards and all required parts except the enclosure. The TAPR phone number is (602)-746-1166.

```
WA5ZIB>WA5ZIB:
HELLO TEST! DE WA5ZIB

BJ1JAS>BEACON:
JAS-1 M0 87/02/26 23:41:00
Telemetry Information:
#00(1st):solar cell current = 1.91*(N-4)   mA
#01(2nd):battery current    = 3.81*(N-528)mA
#02(3rd):battery voltage    = N/1000*21.0   v
#27:bat depth of discharge  = (N-500)/189 AH

** CONNECTED to KA9LNV

BJ1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:18
257 558 707 713 768 870 890 864 003 354
646 002 588 630 619 616 617 617 688 001
722 710 722 716 758 677 926 489 000 000
010 111 100 000 100 000 001 100 101 000

WA5ZIB>KA9LNV:
HOW COPY

BJ1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:52
227 574 705 710 766 879 890 864 003 354
646 002 586 630 619 616 616 617 688 001
222 711 722 715 757 676 926 490 000 000
010 111 100 000 100 000 001 100 011 000

HELLO ANDY FROM ED, COLUMBUS INDIANA!

BJ1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:56
223 577 705 710 766 879 890 863 003 355
646 002 586 630 619 616 616 617 688 001
722 711 722 715 757 677 925 490 000 000
010 111 100 000 100 000 001 100 111 000

WA5ZIB>KA9LNV:
TNX FOR CONNECT

BJ1JAS>BEACON:
JAS-1 RA 87/02/26 23:44:04
210 583 705 709 765 878 891 864 003 364
646 002 586 629 619 616 616 617 688 001
722 711 722 716 758 678 926 490 000 000
010 111 100 000 100 000 001 101 101 000
```

Fig. 1. A portion of the first U.S. Fuji-OSCAR 12 mode-JD QSO between WA5ZIB and KA9LNV.

Finally, you will need a TNC. The FO-12 modem interfaces with only a few wires but requires cutting one PCB track inside the TNC. Most TAPR-style TNCs will allow easy bypassing of the internal modem. All that is left to add is a terminal or computer with an RS-232 port and communications software.

Too many things require attention during each JD pass to allow for casual note-taking. Hard copy or memory storage is best, but a simple alternative is to record the received audio on a quality cassette deck. It can be played back later through your system. These methods will help keep your log straight and allow for later study of the telemetry that was received during your packet contact.

When you get all the pieces together for Fuji's digital mode, you will have an impressive array of wires and boxes. To make contact with another station via the satellite, do not include a "via" in your contact request. If you were to see my call between the frames of telemetry, just send: C WA5ZIB. The satellite will simply transmit all valid frames without any modification. Later, you will see further schedule changes and software upgrades as the satellite controllers in Japan learn more about FO-12's impressive capabilities.

UPDATES

AMSAT-OSCAR 10 is still in a period of low solar illumination. Continue to avoid all use of AO-10 until early May when once again the sun angle will provide sufficient power for transponder activi-

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APPLE	IBM	Amtor
H-89	DG-64	Hamtex
DDX-64		Amtorsoft
		Supertap

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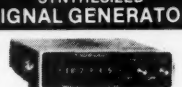

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No. 10 16 S-160-80-40-20-15-10 -2 traps 83 ft. – $89.95

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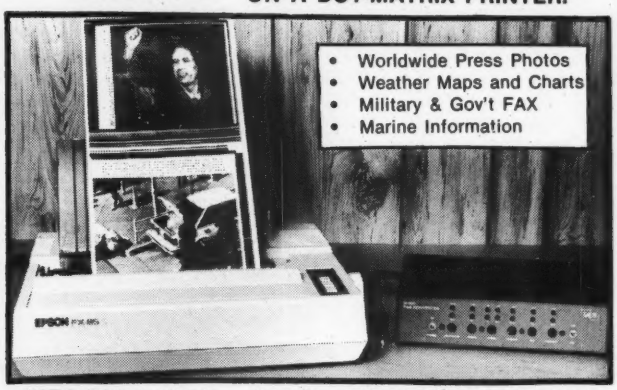

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FLC12	1/2" Corr. Copper Black Jacket	1.59
FLC78	7/8" Corr. Copper	3.92
NM12AL	N Conn., 1/2" Alum. (Male or Female)	22.00
NM12CC	N Conn., 1/2" Copper (Male or Female)	22.00
NM78CC	N Conn., 7/8" Copper (Male or Female)	54.00

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1102	RG8 95% Shielded Foam	30.00	.32
1110	RG8X 95% Shield (mini 8)	15.00	.17
1130	RG213/U Mil. Spec. 96% Shield	34.00	.36
1140	RG214/U Mil. Spec. - Dbl. Silver	155.00	1.65
1180	Belden 9913 Low Loss	46.00	.50
1705	RG142B/U Teflon/Silver	140.00	1.50
1310	RG217/U 5/8" 50 ohm Dbl. Shield	80.00	.85
1470	RG223/U Mil. Spec. Dbl. Silver	80.00	.85
1450	RG174 95% Shielded Mil. Spec.	12.00	.14

ROTOR CABLE — 8 COND.

Nemal No.	Description	100 Ft.	Per Ft.
8C1822	2-18 Ga., 6-22 Ga.	19.00	.21
8C1620	2-16 Ga., 6-20 Ga. Heavy Duty	34.00	.36

* Shipping $3.00 — 100 Ft. / Conn. $3.00 / C.O.D. $2.00

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Nemal No.	Description		Each
NE720	Type N for Belden 9913		4.25
NE723	N Female Belden 9913		4.75
PL258AM	Amphenol Barrel		1.45
PL259	Standard Plug for RG8, 213	10/5.90 or	.65
PL259AM	Amphenol PL259	10/7.90 or	.89
PL259TS	PL259 Teflon/Silver		1.59
UG21D	Type N for RG8, 213, 214		3.00
UG83B	N Female to PL259		6.50
UG88C	BNC RG58		1.25
UG146	SO239 to Male N		6.50
UG175/6	Adapter for RG58/59 (specify)	10/2.00 or	.22
UG255	SO239 to BNC Amphenol		3.75
KA51-18	TNC RG58		4.35
AM9501-1	SMA RG142B		8.95
SO239AM	Amphenol SO239		.89

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Nemal No.	Description	Per Ft.
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GS12	1/2" Tinned Copper	.40
GS316	3/16" Tinned Copper	.15
GS316S	3/16" Silver Plated	.35

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Nemal No.	Description	Per Ft.
HW06	6 Ga. insulated stranded	.35

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ty. If there is cooperation with the call for suspended operation, you increase the chances for future activity. Check the AMSAT nets for updates.

UoSAT-OSCAR 9 and UoSAT-OSCAR 11 continue in good health. On Wednesdays, UTC, the digipeater on Uo-11 is activated for a short period during each pass. On Sundays, between 0000 UTC and 1200 UTC, the 435.025-MHz beacon is activated simultaneously with the 145.825-MHz beacon. The team at the University of Surrey will appreciate reception reports from listeners. Your card will ensure that better services are provided on a continuing basis.

Listen on 145.825 MHz FM and report to the UoSAT Unit, Attention: Martin Sweeting, University of Surrey, Guildford, Surrey, GU2 5XH, England. If you request a QSL for your reception report of either satellite, be certain to include a self-addressed envelope with sufficient IRCs or British postage for the return trip.

Radio 5 and Radio 7 may still be operational, but due to the poor battery conditions on both satellites, you will have to look to the nets and your own observations to determine their condition.

There has been little word on the status of either Radio 9 or Radio 10. The extreme cold during January caused a backlog on the Soviet launch schedule, but if things go well, there may be new satellites about the time you read these words. Monitor the AMSAT nets for the latest news of these pending launches.■

ABOVE AND BEYOND

Peter H. Putman KT2B
3353 Fieldstone Drive
Doylestown PA 18901

TRY SOMETHING NEW

As most of you know by now, the FCC has finally resolved (in their own mind) the question of what to do with 220 MHz?" In their own unique fashion, they've proposed (as this is being written in early March) to cut the band by 40%, cram all of the weak-signal/moonbounce/packet/link/FM/repeater operations into the remaining 60%, and wash their hands of it once and for all.

This is definitely one of those "the operation was a success, but the patient died" situations. In fact, as many of you read this, the deadline for reply comments has come and gone (unless an extension has been granted), and, in fact, the dissection of 220 will become reality.

The proposal (NPRM 87-14) is so well detailed, it indicates that the commission has virtually decided the question, regardless of any input from the amateur community. What scares me is the wording to "give the Amateur Service an Exclusive allocation at 222–225 MHz," which indicates that the jury has delivered the verdict, the judge has mandated the sentence, and the only thing we can hope is that the rope breaks on the gallows.

Regardless of the outcome of this NPRM, the situation didn't have to come about. All it would have taken is a bit more activity on everyone's part to enhance the status of 220 MHz in the commission's eyes. Honestly now—how many of you own at least one piece of 220-MHz gear? Probably a hand-held if anything.

The lead editorial published a few months back in *73* made mention of the dollar value of the various amateur allocations if placed in the hands of commercial interests. Don't take it lightly! How do you think the Electronic Privacy Act of 1986 came about?

"What's the point?" you ask. The point is—try to break out of the rut. If you've thumbed through *73* and the other magazines thinking, "Gee—it might be fun to try OSCAR or listen to satellite transmissions," don't think any more. Whip out that wallet or checkbook—call the 800 number—put your order in for a 70-cm multimode or transverter, amplifier, and antenna. Try operating a little on 50 MHz with a borrowed rig before you say, "The band's too quiet" or "I'll get TVI complaints" or "How far can you work on 6 meters, anyway?"

The TH-31AT I reviewed last year cost me all of $225 for the radio, two batteries, charger, external antenna adapter, and cigarette lighter cord. With it, I've worked through repeaters in New Hampshire, New York, South Carolina, Chicago, and Arizona while on business trips, and the whole thing slips in my shirt pocket.

Got a VCR? A camera? How come you haven't tried ATV yet? There's certainly enough equipment available to get you on in a hurry at the right price.

Want to really work hard for a contact? Try mountaintopping on 902 or 1296 MHz with high-gain antennas and a few Watts of power.

Think working halfway around the world on 20 meters is fun? How about halfway across the U.S. with 2 Watts on 23 cm (as was done during the now-infamous Thanksgiving tropo opening)!

Got a personal computer sitting around doing nothing? Get on packet. TNCs abound! Hop up on 220 and get away from the crowd on 145 MHz.

Want to see what the weather will really be like tomorrow? Pick up a satellite converter and see what you're missing.

Tired of working repeaters on 2 meters? Flip that switch marked "USB" or "CW," get a horizontally polarized beam, move down to 144.200, and start calling CQ. Ever work 2-meter SSB mobile? 6-meter FM mobile?

Of course, I could go on and on. The point is—we have a wealth of spectrum space just beckoning to us. As the impact of Novice Enhancement becomes felt, it is incumbent that we retain these higher frequencies for the future when we will really need them. But we must get on now and encourage activity, otherwise the 220-MHz situation will just happen again and again.

Come on—make 1987 the year you'll try some new piece of equipment on a new band. Check out the reviews in *73*. If building's your thing, there are plenty of places with kits to get you up and running. And, of course, you can never spend enough time experimenting with antennas... can you?

FUN THINGS TO DO

Now that I've had a miserable time trying to operate portable during winter contests, it's time to plan the summer contest schedule. The problem has always been one of portability—being able to bring the "most" in a station with the "least" in weight. Up until now, that meant 2- and 6-meter multimodes with linear transverters for each band. It shouldn't surprise you, then, that the ads for Yaesu's new FT-290R and FT-690R MKII series caught my eye.

Aided by our ever-loving editorial department, I was able to procure one of each for the ultimate review: Drag 'em up the mountain and see if they make it! Photo A is a shot of the units. Indeed, they make a nice tidy package, and this is accomplished in a unique way: The front end, low-level TX, and microprocessor stages are encased in a separate housing that either (1) snaps onto a heat-sink/power-amplifier combination for instant mobile use with 25 Watts on 2 and 10 Watts on 6 or (2) snaps onto a battery case containing nine C cells to provide 2.5 Watts of rf output on either band.

If you really want to find out how good your hilltop location is, try a couple of these with some portable antennas such as a quagi or collapsible beam (Tonna makes a nice one for 144 MHz). Think of it—two independent, self-contained stations for 6 and 2 with antennas and the thing weighing about 30 pounds including the masts! Both radios operate CW/USB/LSB/FM, and both have ten memories, dual vfo's, an easy-to-read LCD display, and the ever-present RIT control, labeled CLARIFIER.

I plan to haul these up a few peaks for as many of the summer contests as time permits—possibly even with outboard amplifiers if I can bring a bigger power source. It should be fun, so look for a review sometime in the late summer.

How about you? Ever try mountaintopping before, even if only with a hand-held? At least one summer contest recognizes the efforts of QRP and portable stations (*CQ* WW VHF WPX) with a trophy if you are high-scorer in your category. Even if you're not into contesting, take a walk up some hill nearby or hike into a rare grid square and put it on the air with your little station. It'll require a bit more operating skill on your part, but I guarantee it'll be more fun than sitting home rag-chewing on 146.52 MHz sim-

plex. If you want to bring the computer along, then go portable packet. That should keep you quite busy!

MAILBOX DEPARTMENT

Some interesting correspondence has crossed my desk in recent weeks, and I'll pass it along. Walt Werner W2TT of Tinton Falls, New Jersey, writes in to discuss the "Watts 'N SWR" article from October, 1984. Boy, old articles never die! He expresses interest in constructing an swr bridge using five sections of 1/8-wavelength transmission lines, based on a circuit in the December, 1986, *RF Design*. Walt goes on to inquire if I'd be interested in manufacturing a prototype of such a design on a printed circuit board.

Well, my experience with PCB design hasn't gotten that far, Walt, but there might be a reader who'd have more on the ball in this area. I don't think I've fabricated a PCB in about a year (time problems, mostly) and haven't had a chance to review the article you've mentioned. How about it, folks? Anyone willing to give Walt a hand in trying to fabricate such a coupler for 144 MHz should drop him a line at 131 Woodland Manor, Tinton Falls NJ 07724.

Ross Forbes WB6GFJ writes in to mention a problem common to TS-430S owners using transverters: nonlinear output power control. The only way to vary the output of the TS-430S is by using the CARRIER control, but generally full output is reached when the control is at about half setting. Ross mentions that he'd like to be able to throttle back the output of his MMT 432/28S for OSCAR work as needed. The only easy way to do this reliably is to use a stepped attenuator after the XVRTR OUT connection on the 8-pin DIN plug before it goes to the 28-MHz input on the MMT 432/28S.

Such pads are easily found at flea markets—I bought two for $5 at such a flea market two years ago. Both offer a total of 30 dB in switched steps of 2, 4, 8, and 16 dB. The switches can be ganged to create intermediate values. With such a system, you then set the CARRIER control to its full clockwise setting and leave it there. Also set the MIC GAIN control to its normal setting and leave it untouched. The MMT 432/28S is a very linear device down to about −10-dBm input levels and will respond accordingly to switched values of attenuation at the 28-MHz input.

The Yaesu FT-290R MKII and FT-690R MKII transceivers configured for portable operation (left) and mobile operation (right). KT2B will soon be hauling these revolutionary rigs up into the hills to do a comprehensive review.

I'd also like to thank the following folks for adding me to their mailing lists: Gene Shea KB7Q of Montana, who publishes the *2 Meter EME Bulletin* ($15/year, 417 Staudaher Street, Bozeman MT 59715), and Charles Osborne WD4MBK, who publishes an interesting compendium of general and technical information periodically, called the *Southeastern VHF Society Newsletter* ($5/year, 881 Lakeshore Drive, Berkeley Lake GA 30316-3041). Charles has been the source of much useful information lately, especially regarding the KLM balun problem and ways to correct it.

The *Southern California Six Meter Club Newsletter* (PO Box 448, Cypress CA 90630) arrives faithfully each month from the West Coast and contains some interesting stories, including the club's monthly transmitter hunts. (Boy, would the FT-690R be good for that!) And finally, the folks in Woodlands, Texas, have gotten their name straightened out and have formed the Gulf Coast Microwave Society (PO Box 7853, The Woodlands TX 77387) with the intent of promoting activity on and above 432 MHz.

Now, look carefully. See all of those names I just mentioned? Besides them, there are probably hundreds of other clubs I don't know about that exist to promote a segment or mode in the VHF/UHF/SHF/EHF spectrum. The above groups are active; they publish, and best of all, they'd like to share their information with you (albeit at a price). I will try to update the listing of clubs and newsletters as I can during the year, and hopefully the entire December column will be a compendium of such material for future reference. Drop them a note and let them know you're interested!

REMEMBERED

The various magazines regularly note the passing of amateurs from the scene. Some were celebrities; others just another guy or gal down the block. I'd like to take a minute to remember someone important to me... my uncle, Raymond Putman N2FYC, whose life was claimed by cancer on February 19, 1987, at age 64. Ray had only been licensed for four years, but quickly rose from Novice to Advanced in that time period. He was into everything—2-meter FM, HF SSB, teletype, antennas, and even computer operations. Some of the *73* crowd will remember him as part of the infamous "SCORE" gang at Dayton the past two years.

I'll remember him for one main reason: Ray rekindled a lot of enthusiasm in me for amateur radio that had been sort of dormant over the years. It's quite refreshing to see somebody dive in with so much enthusiasm at an age when many other hams are content to sit around grumbling about the QRM on 75 meters. Here was a fellow who loved to work with his hands, and in short order was constructing antenna tuners and keyers from scratch. I didn't know you could use electrified cattle wire for an 80-meter dipole until Ray showed me how he did it!

Beyond all else, Ray found the real value of amateur radio: making friends. Boy, did he! Ray was an active member of the Watertown Radio Club, many of whose members I had only rag-chewed with from time to time on the 10/70 repeater in Watertown while passing through. It was an honor for them to be his pallbearers, and I was privileged to meet them. He was also active on the Carrier Net on 75 meters, and puttered around on 160 as well. Besides that, he found time to remodel his house, pursue his rockhounding, and make his own clothes—the envy of any tailor.

I only hope that other hams who were lucky to have met him will have some of that enthusiasm kindled in them as well (or rekindled as the case may be). This is the legacy that Ray left to amateur radio: Try to find something different every week to do with ham radio. It wouldn't hurt if you made a few friends along the way, either. My condolences go out to his wife Louise and children Mark and Shawn. He will be missed.

ADDENDUM

Just as I was getting ready to send this month's column via the modem to Peterborough, an excellent directory of 6-meter activity, repeaters, and DX listings arrived from Harry Schools KA3B. This is a very thorough listing of virtually anything and anybody pertaining to the 50-MHz band, and lists nets, newsletters, an extensive repeater directory, beacons, 50-MHz awards (and rules), and major contests, to name just a few categories! Obviously, Harry put a lot of time into this directory. If you are a serious 6-meter operator, you should have a copy. For further information, write Harry at 1606 S. Newkirk Street, Philadelphia PA 19145.

Also, news has come via Roger Cox WBØDGF and the Midwest VHF Report of some strong 144-MHz Es openings in February (!!!) from California to Kansas and Nebraska. (And you were waiting for the summer!) Other openings occurred from California to Oklahoma and Texas about the same time. The point? Keep those receivers on the calling frequencies—even in the dead of winter. You never know what will show up. Until next month, see you Above and Beyond!■

WEATHERSAT

Dr. Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

Date	01 May 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	12267	3204
Eq. Crossing Time (UTC)	0050.85	0011.20
Longitude Asc. Node (Deg. W.)	146.18	69.45
Nodal Period (Min.)	102.0851	101.2979
Frequency (MHz)	137.62	137.5

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

WSH SCAN CONVERTER

This month I am going to spend some time discussing the *WSH* scan converter since I get quite a bit of mail from readers who want to know what in the world I am talking about. In covering this ground, I will also address some general problems in using computers for scan conversion.

First, the *WSH* part is easy—it refers to the third edition of the *Weather Satellite Handbook* published by your faithless columnist. It costs $12.50 plus $1 postage in the U.S. and $2 elsewhere. That takes care of this month's plug!

Now to the scan converter part. There are two basic approaches to building a digital scan converter. You can construct a dedicated unit with either hard-wired or built-in microprocessor control or you can build a unit around an existing microcomputer. The latter is usually a desirable alternative because you save yourself a lot of effort and get the flexibility of easy software changes should you wish to experiment.

The nicest option would be to require nothing but a computer and some software, but that presents many problems. There are quite high-priced (by the standards I will be talking about later) computer options that can generate a sufficiently high resolution image with enough grayscale values for each pixel to be quite acceptable. Unfortunately, such a system would be applicable only to those with the cash to purchase a similar computer.

Even if you wanted to spend the money for the computer, you would still require some additional hardware to provide satellite signal processing, A/D conversion, and some sort of timebase. You would also require software. Unless you can write your own, you will find that there tends to be less software available for expensive computer configurations and what there is tends to cost more—it's called free-market economics!

Less expensive computers have a larger user base, which translates to more programmers, but here we run into other problems. Low-end personal computers and even 16-bit systems with standard or moderately enhanced graphics capabilities (i.e., CGA and EGA standards) may have sufficient resolution, but they tend to be color-oriented and you cannot spend a lot of time looking at false-color images.

What you really want is a decent monochrome display with at least 16 grayscale steps per pixel. It is far easier to add false-color capability to a good monochrome display than to try to persuade a 4-color display to do the job!

The key around the spatial/tonal resolution dilemma is to use a dedicated display circuit, complete with its own RAM, that could care less about the graphics capabilities of the computer it is connected to! The computer and its RAM will be used to sample and store incoming image data, but you will not depend on the computer to *display* the image—that's a job for the external display board.

Since any computer system is going to require additional video processing and timebase circuits, these can be added to the external display circuit. This results in a single hardware add-on that, with proper interfacing and software, should work with any computer!

That is exactly what the *WSH* scan converter is—an external board that provides all the display, satellite video processing, timebase, and computer interface functions. The circuit uses 32K of static RAM (a single 43256 or four 6264s) and produces a 256-line image with 256 pixels/line and 16-step grayscale coding.

The video circuits include agc, video pre-filtering, full-wave detection, and post-detection filtering. The timebase circuits involve a crystal oscillator and phase-locked loop for compatibility with both "live" and tape-recorded imagery. The keynotes of the design are simplicity of construction and setup and low cost.

Only 14 ICs are used; the total component cost to stuff the board will range from $60 to $75 (mail order, depending upon supplier and memory option selected), and the entire board can be checked out with nothing more elaborate than a logic probe and multimeter. Connection to a host computer is *not* required for board setup. False-color capability can be added with a single connector if you have an RGB (8-color) or RGBI (16-color) computer monitor available.

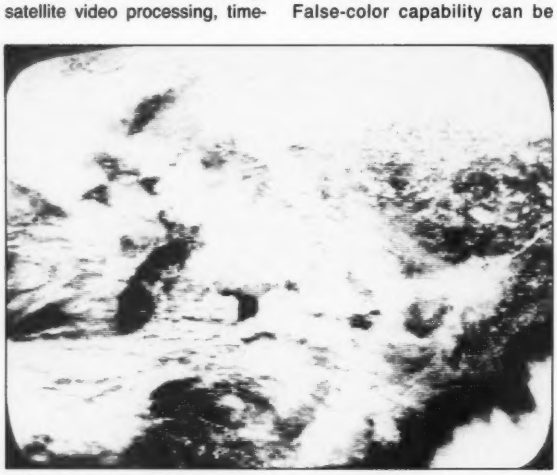

Photo A. The default full-frame display of a METEOR 2-15 pass obtainable with any CoCo model using the 120-lpm mode. Michigan and the Great Lakes are near the center of the image, the East Coast is angling upward in the lower right, and most of the upper half of the picture shows Ontario and Quebec.

Features for the RAM

While the *WSH* converter board provides all of the circuits for 256 x 256 display on a standard TV monitor (or TV set if an rf modulator is used) and all of the required satellite signal circuits, what can be accomplished at what level of difficulty is a matter of what computer you have it hooked up to.

If you have a 64K 8-bit system, you really don't have that much more available RAM than is required for the basic display (32K), so you are basically restricted to sampling 256 pixels from 256 lines. Essentially the computer sampling must match the display capabilities. Although there are some high-resolution tricks that you can do in real time, your primary display options are mainly centered on sampling to produce a full-frame display at an effective resolution of 256 x 256.

If more memory is available, you can sample the picture at a higher resolution than the display, but it takes quite a bit more memory to be truly useful. Doubling your resolution to 512 x 512 in RAM requires four times the memory since you must double the original 32K just to get twice as many pixels/line and then double that to get the 512 lines! This means that the RAM required for image storage would be 128K (4 x 32K), and you cannot do this with a computer with only 128K of RAM available—some of the computer memory has to be allocated to software, variable storage, and other aspects of the operating system.

If you have a 128K system, it hardly pays to increase just the pixel or line count—you would be

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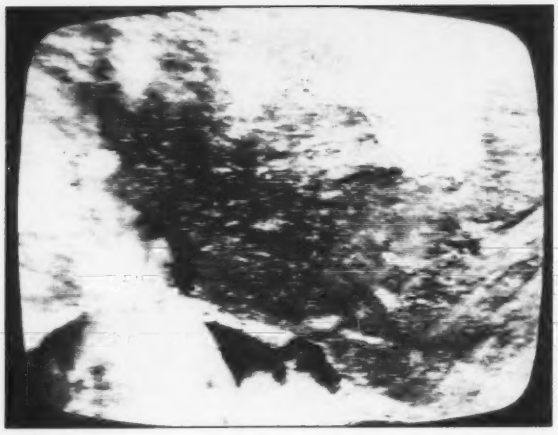

Photo B. A medium-resolution quad from a METEOR 2-15 pass. The area covered here is about 1/4 of the full frame with an effective resolution of 512 x 512. Lake Superior lies along the lower left of the image.

Photo C. A high-resolution quadrant from the METEOR pass in Photo A. The white circle at the right is Lake Manicouagan (1,024 x 768 effective resolution).

better off to use the additional memory to store more pictures or store 6- or 8-bit pixel data to give yourself options for image-contrast processing. I will talk more about that in future columns.

If you have a lot of available RAM (256K or more), then you are in a position to store far more detailed images than the display can handle. With such a high-resolution image in memory, you can sample the stored image to create your basic full-frame image on the 256 x 256 display or you can display selected quadrants of the image in memory to get the advantages of higher resolution. The display is still 256 x 256, but you can use this display as a "window" to achieve higher effective resolution at the expense of the area of image covered by the display. I will show you some actual examples of this before I quit for this month.

The CoCo—A Good Choice

Although the display doesn't care what kind of computer it is connected to, for the *WSH* project I chose the Radio Shack Color Computer (CoCo). There were lots of reasons for that choice. They include low cost, long-term support from the manufacturer, a good history of retaining compatibility as models are upgraded, and inexpensive and readily available assembly-language programming tools.

Additionally, the CoCo has a tremendous range of I/O resources that come as standard equipment. The joystick ports can be programmed to provide the needed A/D conversion of the video signal, eliminating the need for a hardware A/D. The I/O capability of the serial and cassette ports provides all the other major control and status I/O, and the data bus is accessible through the cartridge port.

Using the CoCo, you need only a single chip for the interface to the computer. Interfacing to any other computer is not a monumental task, but it *is* more complicated. In fact, the *WSH* has a far more complicated interface for the CoCo than is actually required, but that approach was taken to provide a thorough tutorial for those insisting on interfacing to other computers!

Aside from the "What is the *WSH* scan converter?" questions, number two in popularity is "I want to use my PC for the scan converter. How do I do it?" Actually, for a PC, you can substitute the name of almost any computer—if it has been out there on the market, I have been asked about it!

Well, folks, I'll let you in on a secret. I have a PC in the satellite station, but I never gave more than a passing thought to using it for scan conversion. The reason is twofold—conflict and cost. The PC is a real workhorse, doing a wide variety of jobs from word processing to CAD. That's the real problem with it. There are innumerable applications programs for the machine and too many ways to use it already.

Once you begin to scan-convert pictures, particularly if you hook into the hundreds of pictures each day on WEFAX, you are going to want to watch pictures. The last thing you need is to have to decide if you want to unhook the scan converter so you can do some writing or work RTTY. If the PC were the center of the display system, I would soon be justifying another one just to avoid the conflicts. There are jobs the PC can do that other less capable systems just can't, but scan conversion isn't one of them.

For $100 to $300, depending upon the model, you can buy a CoCo and dedicate it to the job of making satellite pictures. That is about on par with what you would expect to spend on I/O boards for the PC, but now there is no conflict. If you want to use a PC or any other mid- to high-end computer, be my guest. It will work fine, providing someone will write the software, but you will have a $100 saddle on a $10 horse.

One seeming advantage of a PC is the fact that you can save pictures to disk. About ten 32K images will fit on a standard PC disk, but *each* high-resolution picture (discussed below) requires more storage than is available on a standard floppy. You could cram two or three of them on an AT disk, but that kind of system is really beginning to escalate in the cost department! An inexpensive CoCo with pictures stored on old-fashioned audio tape begins to look pretty attractive!

Available CoCo Software

Three versions of software are presently available for the CoCo, depending upon the model you have. The CoCo 1/2 program is available on cassette and supports the CoCo models 1 and 2. This program displays full-frame images in the 256 x 256 format and includes automatic WEFAX and manual NOAA APT, 240- and 120-lpm displays, plus inversion and complementing of displayed images, grayscale, etc.

The CoCo 3/128 program is designed for the 128K CoCo 3 and has basically the same features as the previous program with the added benefit that images can be saved in digital form on cassette.

The CoCo 3/512 program for the CoCo 3 with 512K of RAM is the real powerhouse of the trio. While the previous programs are limited to sampling pictures to match the display format, the 512K version samples 1,024 pixels/line and 768 lines—essentially full resolution. This image in memory is sampled to provide the default full-frame display, and the results look identical to those obtained with the previous programs.

Once a picture is in memory, however, there are two additional display modes. The medium-resolution option lets you look at any 1/4 quadrant of the image (there are nine that overlap) with an effective resolution of 512 x 512. From any medium-resolution quad, you can select any one of nine possible high-resolution quads, each producing an effective resolution of 1,024 x 768! You can shift freely from one mode to the other and examine any parts of the picture down to a level that is equivalent to a good FAX system!

Both the CoCo 3/128 and 3/512 programs are available on EPROM and both programs are included. No matter which model you start with, your software acquisitions are complete!

So that is the *WSH* scan con-

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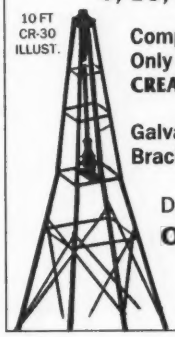

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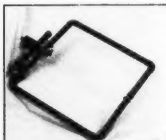

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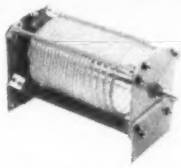

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verter. You will see lots of examples from it in future columns (not to mention this month!). It provides a heck of a lot of display power for very modest bucks and offers plenty of flexibility for trying new tricks—some of which I will cover in upcoming months.

Pictures of the Month

This month I am doing pictures because the completion of testing for the CoCo 3/512 program coincided with the launch of a new Soviet METEOR spacecraft, providing a marvelous change of pace from the WEFAX schedule! METEOR 2-15 was launched on January 5, 1987, and as this is being written (early February) the spacecraft is providing superb imagery, passing overhead near noon each day with transmissions on 137.85 MHz.

Sun angles are perfect and all of the Midwestern and East Coast snow provides excellent potential for recognition of ground features. All in all, it's a very good chance to show what the *WSH* scan converter can do with polar imagery.

By way of background, all the pictures were received using the *WSH* "Zapper" omnidirectional antenna, the Hamtronics GaAsFET preamp reviewed in an earlier column, and a Regency MX-5000 scanner receiver. All pictures were automatically tape-recorded using the system to be described in next month's column.

Photo A shows the default full-frame display of a METEOR 2-15 pass that would be obtained with any CoCo model using the 120-lpm mode. Michigan and the Great Lakes are near the center of the image, the East Coast is angling upward in the lower right, and most of the upper half of the picture shows Ontario and Quebec. Lake Michigan is almost cloud-free, a bit of southern Lake Huron shows through, while Superior, Erie, and Ontario are socked in!

Note the clouds following the East Coast approximately 100 miles offshore. The St. Lawrence River/Seaway (ice- and snow-covered) shows as an angled white streak near the right edge about halfway up. Right on the edge of the display above the St. Lawrence is a little white circle—our old friend Lake Manicouagan that we will look at more closely in a moment.

"If you want to use a PC or any other mid- to high-end computer, be my guest."

If this were all the *WSH* system could do, most folks would be quite happy. If you have a 512K CoCo, however, the fun is just beginning!

Photo B shows a medium-resolution quad from a METEOR 2-15 pass the day prior to the one in Photo A. The area covered here is about 1/4 of the full frame with an effective resolution of 512 x 512. Lake Superior, with a pretty cloud plume across its center, lies along the lower left of the image.

Note the band of heavy lake-effect snow along the north shore of the lake, extending east to the west shore of Thunder Bay. The pronounced white ellipse north of the lake is ice- and snow-covered Lake Nipagon. James Bay and the southernmost portions of Hudson's Bay are hanging in on the upper right.

Any portion of the full frame can be examined at this resolution or you can flip back to the full-frame format in a moment. The party is not over yet for there is still one more resolution level available.

Photo C shows a high-resolution quadrant (about 1/4 of a medium-resolution quad or 1/16 of the full-frame image) from the METEOR pass in Photo A. The white circle at the right is Lake Manicouagan in high resolution (1,024 x 768 effective resolution).

There was a VHRR image of the lake in the January column. You might find it interesting to get out a magnifying glass and compare this image with the one from January. Virtually all of the tributary embayments around the lake that are visible in the VHRR shot are also seen here, including the hook-shaped internal embayment on the right side. Remember that this feature is about 45 miles across!

If you have the January VHRR shot in front of you, follow down and to the left of the lake and you will see three parallel white arcs. These represent three strips of forest clear-cutting. Now move to the left of the lake in this month's image, almost to the left edge of the display. The two clear-cut strips that are quite close to one another appear as one broad arc, primarily due to a small patch of overlying cloud cover, but the third strip is clearly resolved.

By the way, the vertical black stripe at the far right, flanked by two white stripes, is part of the alternating 13 white and 13 black stripes that make up the METEOR audible line sync pulse.

This is not HRPT, but I think most of you will not argue that it is a display system worthy of serious consideration—even if it does use *only* a CoCo! In future columns, I will be showing you still other things that you can do with the system—as if this were not enough!

Next month I will discuss some approaches to automatic taping of satellite signals so you can get pictures like these while earning enough to convince the spouse that you really can afford some new weather satellite hardware.■

ATV

Mike Stone WBØQCD
PO Box H
Lowden IA 52255

CHEAP AND EASY FSTV

I have been promising to show you a way to get on FSTV receive for just a few dollars so you can tune and watch all the local action. This month's column fulfills that promise.

Some of the newer TV sets with individual thumbwheel setting TV channel tuners will indeed go down into the ATV band around 439 MHz. My wife, Rose KAØSUT, recently gave me a little Emerson "mini-TV" (1.5-inch B/W screen). Henry Ruh KB9FO was down for the weekend (eating all my birthday cake) and immediately, to my wife's surprise, removed the set from its case, located the UHF TV tuner, put a signal on the air at 439.25 MHz, and tweaked it ever so slightly. Now when I tune up on UHF at the bottom end of channel 14, I can see my direct picture.

We put it on my four-by-48-element Jaybeam antenna system (hardline and mast-mounted preamp, of course) and received KAØBVT 25 miles away at near close-circuit WITH NO DOWNCONVERTER! The problem in doing that, though, is that TV sets were not designed to go down into that part of the world, and they start falling off in sensitivity dramatically (or they physically just won't go any lower in frequency).

Eventually you will need the help of a downconverter. P.C. Electronics will have reduced specials on ATV downconverters this year at Dayton (or by mail order). Wyman Research in Waldron, Indiana, also has some economically priced ATV downconverter "kits" (contact W9NTP).

What about a little gadget that perhaps is not quite as sensitive on receive (preamps are easy to build or cheap to buy) but that tunes both the ATV and the commercial UHF TV band in one sweep? Interested? Read on!

The March/April 1985 issue of *The Spec-Com Journal* ran an article by Dr. Clyde Miller WB4AOH on using surplus UHF TV tuners padded down to receive ATV frequencies. He used a Radio Shack Mitsumi UES-A56F UHF-TV tuner (catalog #277-220). These neat little devices sat around for a few years at $24.95; but in 1985, the decision was made to close them out.

ATV operators caught wind of it and gobbled a lot of them up for $4 to $7 each, so it is doubtful if you could find them today, except maybe at hamfests. (You might also look around in a Radio Shack surplus barrel or have the store manager call Ft. Worth to see if there is any stock left in the warehouse that can be special-ordered.) Other similar devices are available, however, through parts specialty houses for about $12 to $15. They may have other than Mitsumi factory names, but generally they are all pretty much the same.

The device fits in the palm of your hand, is nearly square, and comes in a shiny chrome-like casing. It has ten or more pins sticking out one side to be connected into the TV set, one or two pins out the other side for AFC, and a male RCA jack for a UHF TV antenna input. A few resistors and a couple

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WHAT ELSE DOES IT TAKE TO GET ON ATV?

Any Tech class or higher amateur can get on ATV. If you have a camera you used with a VCR or SSTV & a TV set, your cost will just be the TC70 and antenna system. If you are working the AMSAT satellites you can use the same 70cm antennas on ATV.

DX with TC70-1s and KLM 440-27 antennas line of sight and snow free is about 22 miles, 7 miles with the 440-6 normally used for portable uses like parades, races, search & rescue, damage accessment, etc. Get 50 watts p.e.p. with the Mirage D24N or D1010N-ATV amp for greater DX or punching thru obstacles.

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of capacitors, along with a 5k pot that would vary the dc voltage (.9 V dc was 430 MHz), is usually all that is needed to get it going.

One advantage of this device over a fixed downconverter is that you can tune the ATV band and then slide on up through the commercial UHF TV channels (420–884 MHz) as well. Once built and preamped, the device made a good ATV receiver that could fit inside a home-brew transceiver cabinet. Dale WA4BDX of Shelby, North Carolina, won first place in the Charlotte, North Carolina, "A5" Hamfest get-together in March of 1983 using this UHF-TV tuner device in his ATV rig (see Photo A).

Write to Dr. Clyde WB4AOH at 3701 Frederica Street, Owensboro KY 42301 for more details. Ask him to send you a photocopy of the W4LUB Skeleton Slot UHF Antenna as well. Include a buck or two for his time and trouble and an SASE or return postage.

Long-Distance Fast-Scan TV

Some of you have remarked that you were amazed that fast-scan TV signals could travel so far when band conditions were good. In March, I mentioned the great Thanksgiving weekend contact between Paul Nees KØIWA in Burlington, Iowa, and Ed W3POS in Erie, Pennsylvania (578 miles). That, as far as I've heard, is the #1 USA FSTV DX land-distance record.

It is not all that hard to break, as during that opening it was just a matter of getting people on the air to accomplish the contact. Maybe some of you old-timers have indeed worked two-way FSTV contacts much farther than that. We'd like to hear from you. Include specifics such as callsigns, distances worked, P-signal reports, dates, etc.

Spec-Com Journal has already published ATV's first official DX Award Roster and continues to assemble new contacts for publication. To get on the honor roll, submit your best two-way contacts over 200 miles. Leading the pack is a land/water contact between Floridian WA4GRK and Texan W5VDS held on May 30, 1986, with an average P2 picture some 937 miles. It will be hard to surpass that accomplishment. Red and Frank used 100-Watt amplifiers and modest horizontally polarized beam antenna systems. Contrary to old thought, most of the country is horizontal for better, lower noise level, simplex action.

Photo A. Dale WA4BDX of Shelby, North Carolina, and his award-winning UHF-TV tuner for ATV.

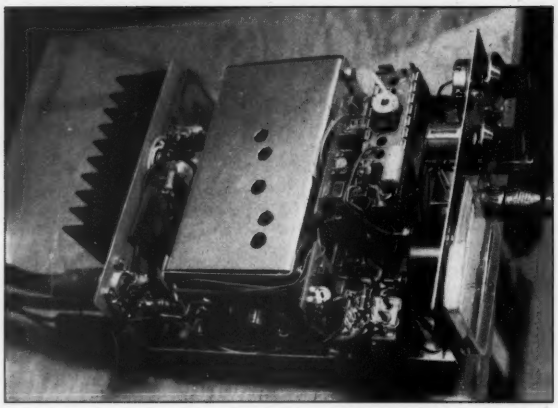

Photo B. W4TOY's home-brew ATV transceiver using the UES-A56F TV tuner.

By the way, there are now 13 ATV repeater or remote transmitter systems in the country using this DX antenna field as well. The conversion list is growing as ATV groups are learning by others' examples that you CAN have your cake (DX) and eat it (omnidirectional repeaters) too!

Several Midwestern and East Coast ATV repeater groups are giving second thought to returning to the H-plane antenna radiation patterns so as not to miss out on these terrific DX band enhancements—20-dB loss on being cross-polarized is hard to overcome, although not impossible. Tracy Monson N9AEP in Moline, Indiana, and Don Miller W9NTP in Waldron both saw or got into one of the Pittsburgh vertical repeater systems that Thanksgiving weekend, although it was reported that no one was around to take advantage of it.

Put up the highest stacked multi-element, hardline-fed, mast-mounted-preamplified antenna system that your pocketbook can afford and you'll be surprised at just how far UHF fast-scan TV will travel. Unless you have a mountain in front of you, you can go hundreds of miles. Fast-scan TV is usually thought of as a line-of-sight communications mode. They wrote the test on that theory too many years ago, before radio amateurs got permission to operate the band . . .

Finding Local Activity

The mail I am getting from readers is unexpectedly heavy! My secretary Patti and I are trying to answer all of it as it comes in and fill your requests at once. My apologies if I don't get back to you quickly on personal questions.

Most mail has been of the "inquiring about activity in my area" type. Might I suggest an invaluable beginning locator that will become a useful addition to your technical library? The *USATVS North American ATV Directory* ($6.95 ppd. from the address at the beginning of this column) lists more than 110 ARRL and USATVS registered ATV repeater and remote transmitter systems in the U.S. and Canada, including the input/output frequencies they operate on, who sponsors them, and other such information.

It contains an up-to-date ATV club or organized group directory, showing more than 70 American fast-scan TV clubs, when they meet, what frequency they hang out on, and how best to contact them. Also, there is a large, full-page map of the U.S. that depicts 2-meter VHF frequencies and UHF antenna polarizations used by the ATV gang across the country. More than 1,000 registered USATVS members are listed, along with dozens of neat "in-shack" operator photos. It also includes my first three ATV columns on the basics of getting started on ATV.

"Put up the highest stacked multi-element, hardline-fed, mast-mounted-preamplified antenna system that your pocketbook can afford and you'll be surprised at just how far UHF fast-scan TV will travel."

Dayton ATV Workshops

I'd like to remind you of the ATV workshop sessions that will be held this year at The Ramada North, 4079 Little York Road, in Dayton, 1/2 mile south of I-70 and I-75. (Last month, the wrong motel was mentioned as the ATV meeting place.) Come on over to our suite Friday night and/or Saturday afternoon/evening and talk ATV and bring your VHS videotapes of local ATV activity and photos of DX contacts!

Formal programs will be conducted at 7 p.m. each night, with John Beanland G3BVU/W1 from Spectrum International being the featured speaker on Saturday night. I'm hoping that we'll be on the air through the Dayton W8BI (vertical) ATV repeater system (or on simplex) at 439.25 MHz; 147.450 simplex is the place to monitor on 2-meter FM.

Yes, there will be ATV mobiles floating around. I might be riding over with Henry KB9FO in his Bronco with 100 Watts and horizontal polarization for the trip. Once we get out of Chicago, we should be able to see some FSTV signals (there aren't any to watch in the Windy City anymore).

Look out Findlay or Indy Group; we will be passing through on Thursday on 144.340! See you at W6ORG's Saturday afternoon ATV meeting, too.■

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Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant status and mode indication. The 240 page manual includes a "quick start" section for easy connection and complete documentation including schematics. Two identical back panel radio ports mean either your VHF or HF radio can be selected with a front panel switch. Other back panel connections include external modem disconnect, FSK and Scope Outputs, CW keying jacks, and RS-232 terminal interface.

The RS-232 connector is also used for attaching any Epson graphics compatible parallel printer for printing Weather Fax. Weather maps and satellite photos, like the one in this ad, can be printed in your shack.

Contact your local AEA dealer today for more information about the one unit that gives you six modes for one low price, the PK-232.

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"When You Buy, Say 73"

73 INTERNATIONAL

NOTES FROM FN42

73 International welcomes Chang Han Dong of Shanghai as our latest foreign correspondent. The People's Republic of China is certainly the largest nation now represented here, in terms both of people (1,034,907,000—1984 estimate) and size (3,691,521 square miles), and Shanghai is the largest city. It is not difficult to predict that the nation will show tremendous growth in the ham radio field (perhaps the greatest percentage of growth by any nation) in the coming 13 years. We hope the courtesy subscription to *73 Amateur Radio* that we send to new correspondents will help that growth. We think it will do more than another new export, anyway: the China Central Television network has announced that it will be importing *Marcus Welby, M.D., Family Affair, Columbo,* and *Star Trek* for regular prime-time showing. Read this column's China news in the May, 2000, edition of *73* to find out which shows the greatest rate of growth, hams or the nation's estimated 400 million TV viewers! It should be interesting!

May 10 is Mothers Day—Dia de las Madres, Fete des Meres, and Muttertag—except in the Central African Republic, where it is on May 28; it is Constitution Day in Japan (3rd) and Norway (17th), National Day in Cameroon (20th) and Tanzania (26th). May 13th is Joan of Arc day in France, the 16th is Discovery Day for the Cayman Islands, and it is Victoria Day in Canada on May 18. On the 14th, it is Independence Day in Israel, in Paraguay on the 15th, and for the Hashemite Kingdom of Jordan it is on the 25th, so send greetings to King Hussein I (Alhussein Ibn Talal JY1), Queen Noor Alhussein JY1NH, and especially to Her Royal Highness Princess Raya JY2RBH, who will be celebrating her first birthday.

ROUNDUP

Brazil. Don't forget World Telecommunications Day, and the XVIII ITU Contest, sponsored by LABRA (Liga de Amadores Brasileiros de Radio Emissao), 0000 UTC, Saturday, May 16 to 2400 UTC, Sunday, May 17. The object is for amateurs around the world to contact other amateurs in as many different ITU zones as possible, in order to enable their country to win the ITU Plaque, which remains with the country. Only on the 160-, 80-, 40-, 20-, 15-, and 10-meter bands. Details from your local club.

Czechoslovakia via Canada. Marvin Hlavac OK3CAW of Edmonton writes of the OK3KII radio club he "grew up in" in Bratislava (see photo). With their location on a hill, with monoband yagis for 14, 21, and 28 MHz and wire antennas for the low bands, they made about 50,000 QSOs during 1984 and 1985, more than half of them with the USA. Laco OK3CEI is the chief operator; others include Roman OK3CDV, Miro OK3CTM, Priemisel OK3CVM, Juraj OK3CNJ, Ivan OK3UQ, Victor OK3CLI, and Richard OL8CTA (junior op callsign).

WHAT HATH GOD WROUGHT?

On the 24th of this month, hams should celebrate a 143rd anniversary. On May 24, 1844, Sam Morse ended years of living hand-to-mouth on his income as an artist, reaching a payoff to his experiments with the new-fangled notion that electricity traveled along wires. He sent the world's first telegraph message along 40 miles of wire between Baltimore and Washington. His words: "What hath God wrought?"

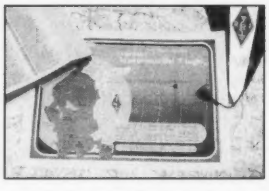
The effects on the world were not exactly instantaneous. Ten years later, Senator Gwin (California) was still trying, unsuccessfully, to convince the U.S. Congress of the marvelous communications potential of the Pony Express. Private enterprise came through, however, and in 1860, the country marveled at the speed with which Lincoln's inaugural address reached all the way from Mississippi to California. Relays of horses got it there in only seven days and seven hours.

The Pony Express headed for the history books a year later. Telegraphy finally triumphed with the 1861 opening of a 3,595-mile cable between New York and San Francisco.

Greece via New York. The Hellenic Amateur Radio Association (HARA) was founded in New York about a year ago, for the purpose of promoting amateur radio among the Greeks living in the United States—and to improve communication among them. For more information, write HARA, PO Box 657, Fresh Meadows NY 11365.

Italy. George A. Lucchi W6NVN, a ham for 51 years, had a QSO with well-known Tony Ceccoli T77C in Northern Italy, and two weeks later hand-delivered his QSL card. (See photos.) George was on a trip to visit relatives in San Marino. Now *that's* the way to improve communications between countries!

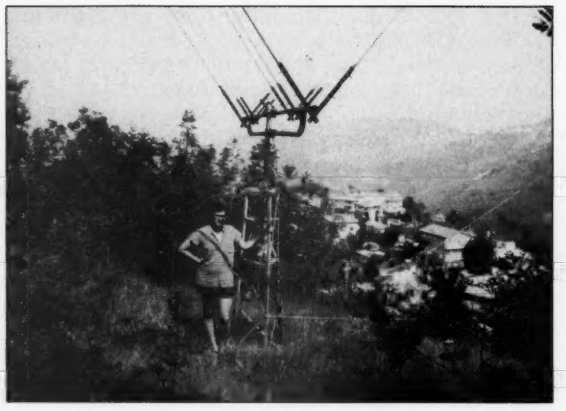
The Varese Chapter of the Associazione Radioamatori Italiano (ARI) has created the "Varese–The Province of the Seven Lakes" worldwide ham and SWL award for the 1.8 to 144 MHz bands, CW,



The Varese–"Province of the Seven Lakes" Award.

T77C (left) and W6NVN.

L to R, Roman OK3CDV, Miro OK3CTM, Laco OK3CEI, and Ivan Lobik.



T77C and his inverted V.

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- **DDS (Direct Digital Synthesizer)**

When you're ready to experience all the multimode excitement 2 meters offers today's amateur, you're ready for the glamorous new IC-275. Its FM capabilities are unlimited, its wideband receiver coverage (138 to 174MHz, Tx 140.1 to 150MHz) includes public services and NOAA weather bands, plus CAP and MARS, and its SSB/CW operations are an OSCAR enthusiast's and VHF DX'ers delight. No other VHF transceiver is comparable to the IC-275 in features, performance, reliability and ease of operation.

Outpacing the Competition. The IC-275 includes dual VFOs, 99 tunable full function memories, true passband tuning, crystal resonant notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, multifunction meter, velvet-smooth tuning knob and an easy-to-read amber LCD readout with variable backlight.

Four Scanning Modes. Full spectrum, programmable limits, mode scan and memory scan with selectable lock-out (scans 99 memories in five seconds!).

An FM'ers Dream Rig. Separate knobs for band tuning and memory selection. Standard repeater splits built-in; odd splits programmable. Includes 32 built-in subaudible tones, and actual subaudible frequency is displayed. Unit supplied with HM-12 up/down scanning mic and DC cord.

It's Packet Ready with rear connector for audio input/output and front panel data switch that reduces switching time to less than 5 ms and mutes the mic.

Two Versions to Fit Your Needs. The **25 watt IC-275A** includes a built-in AC supply. The **100 watt IC-275H** uses an optional external AC supply. Both units are the same size as the ultra compact IC-735 HF rig, and are DC cord interchangeable. You can alternate their fixed or mobile use!

The Matching ICOM IC-475 UHF Transceiver is also jam-packed with deluxe multimode features, and it's the ultimate OSCAR mate for the IC-275. Two versions, the 25 watt **IC-475A** and the 75 watt **IC-475H**, are available to suit your needs.

Exciting New Options include a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-475, FL-83 500Hz 10.7491MHz CW filter and an AG-25 mast mounted preamp.

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 2751288

SSB, RTTY, for contacts made on and after January 1, 1985. No repeater contacts; dupes are valid providing mode and date are changed. Valid contacts are those made with members of the Varese ARI Chapter "that in addition to the report will furnish a progressive number." For HF: European stations will need 15 contacts plus 5 contacts (or stations heard) of stations sited on lakes shore; stations outside of Europe: 5 contacts plus 3 contacts (or stations heard) of lakes shore sited stations. For VHF: 30 contacts plus 5 contacts of stations sited on lakes shore. Requests, with 10 IRCs or the equivalent in Lire, to: ARI Varese, POB 26, 21100 Varese, Italy.

AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018
Australia

VK8—THE TERRITORIANS

The Northern Territory covers an area of 519,788 square miles, with its two main cities, Alice Springs and Darwin, being 1,000 miles apart. Much of this "outback" area has still to feel the touch of civilization.

Alice Springs. Immortalized by Nevil Shute's novel, *A Town Like Alice*, as well as by the film of the same name, is not the frontier town that it was 40 years ago. Today "The Alice," as it is known to most Australians, is the stopping-over point for countless thousands of tourists (particularly Americans and Japanese) wanting to see our "Red Centre," with the main attraction being Ayres Rock.

This area is steeped in history regarding old-time radio and telegraph, with the old overland telegraph station a place to visit. Here you can see depicted in photos the hardships that those hardy men and women went through to build a telegraph line from Adelaide, at the bottom of Australia, to Darwin, at the top. It had to go through 2,000 miles of the harshest dry, desolate conditions that can be faced anywhere.

The grave of the founder of the Flying Doctor Service, The Reverend John Flynn, is located at The Alice. The Rev. John, being an amateur, was made a member of the WIA in 1925. He was responsible for enlisting the aid of Alf Traeger VK5AX/VK8XT in developing the famous pedal radio, with the first successful on-air experiment being conducted between a nursing home in The Alice to Hermannsburg Mission, about 100 miles west of The Alice.

To prove that the transmission worked, the story goes that The Rev. John and Alf drove into the Queensland city of Cloncurry in early November of 1928 on Melbourne Cup Day to publicize a better model of their innovation. The ideal place to set up was in front of the local hotel, and, as a local horse was running in the Melbourne Cup, a crowd soon gathered to see if the results of the race could be obtained quickly. A transmission of over 2,500 miles was heard, the local horse won, and when the crowd that had gathered adjourned to celebrate, the two men were left with the set knowing that they had succeeded in their venture.

Amateur Radio Today. The Alice Springs Amateur Radio Club has approximately 25 active members and claims to have the highest membership-per-head of total population of any place in Australia. Of the 25, eight have satellite capabilities. When AO-10 was in prime operating position, as many as six could be on at the same time.

Alice Springs amateurs supply communications for the annual Camel Cup Race, a nostalgic reminder of the time when we had Afghan camel drivers with up to 900 camels in the camel train which carried most of the goods into and out of the vast center of Australia. This was before the advent of the Ghan Train (named after them) from Adelaide to The Alice, which put them out of business.

Another attraction at The Alice is the annual Henley-on-Todd boat race. This race is held "in" the Todd River, which is dry for years on end. The boats consist of light bottomless canvas-wrapped frames; the propulsion is six or eight people who have pulled the boats up around their waists. Representing various charities or other organizations, the teams run like mad down the dry river bed to the cheers of locals and tourists who line the bank of the river, many with an 807 in one hand and a barbecued chop or sausage in the other.

Most radio traffic is via the local 2-meter repeater. (For those thinking of taking a radio on their trip to VK8, this has just had a frequency shift to 146.350 in and 146.950 out.) A high percentage of The Alice amateurs concentrate on the higher bands, with 6 meters being very active during the last year or so, so it is not surprising that HF contacts are few and far between.

Under the editorship of Jeff Tong VK8TJ, the first club news sheet, *The Centre Conductor*, has just been published by the ASARC. In this issue, he states that plans are under way for the construction of a fully steerable 9-meter parabolic dish for use with upcoming satellites and moonbounce work.

Packet Radio. Packet radio was inaugurated in Alice Springs on May 14, 1986, when VK8RP and VK8TJ established a link using a TAPR TNC-2 and a PK-64. Quickly to follow on-line were VK8s TM, BB, and ZND, also using PK-64 TNCs. The protocol chosen by The Alice amateurs for the local standard is AX.25 level 2 version 2, in order to conform to the Region 3 designated standard, as well as to have compatibility with the upcoming amateur satellite capabilities of JAS-1 and AMSAT 111-C.

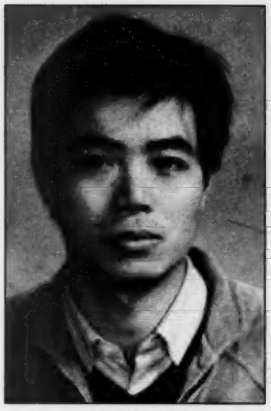
As all of the amateurs now on packet in Alice Springs are also active on OSCAR, the network will be able to extend beyond its physical isolation. If you are interested in trying out an OSCAR packet link with The Alice or if you have any information to contribute, the group will be very pleased to hear from you. Write Rick VK8RP, 44 Memorial Avenue, Alice Springs, N.T., 5750, Australia.

PEOPLE'S REPUBLIC OF CHINA

Chang Han Dong (BY4AOM)
Institute of Estuarine & Coastal Research
East China Normal University
Shanghai 200062
China

Becoming A Ham. In 1982, the first amateur station, BY1PK, was set up in Peking, P.R.C. (People's Republic of China). It was a very important year for Chinese amateurs and me. At that time, I was a student in Shanghai JiaoTong University (SJTU).

Prior to 1982, as was true of other Chinese young people, I knew nothing about amateur radio communication. Before 1949 there were some amateur stations in China, but amateur radio was called off from then on.



Chang Han Dong.

When BY1PK was set up, there were several magazine articles as a result, about amateur radio communication, one after another. They exerted a great influence on me. I got to know elementary knowledge about an amateur station from these articles, and was interested in becoming a ham. Before long, an amateur station was set up in Shanghai (my city). I was very happy then. In 1985, Shanghai's second amateur station was set up, too. It's callsign is BY4AOM.

There are no private amateur stations in China, so I have joined a collective station; now I am a member of BY4AOM. This is an outstanding amateur station: "AOM" means "Able Old Men." There are about 20 members, and the average age is about 65. They often work from morning till deep night, even to the morning as

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HangZou	BY5HZ
SuZou	BY4SZ

Table 1. Amateur stations in China.

young men do. They are *really* A O M!

It is common knowledge that China is a developing country, and its electronic industry is also developing. Therefore, we are not able to buy station equipment for amateur radio and must make it up by ourselves. We made a receiver, antenna, and so on. Besides, we have two transceivers, one a secondhand rig; they were a present to us from our friends living abroad. On Sundays I often go to the station to operate with my friends. We go there by bus or by bike, and it takes a lot of time, about one and one half hours.

In order to help more and more people to understand amateur radio, we conducted a training course for secondary school students. The content included elementary knowledge of amateur radio, English, making a radio receiver, and operating a station: CW, SSB, etc. In addition, we are going to set up an amateur station network in Shanghai and another station, BY4AY, specially for young men. [AY *must* mean "Able Youth"!—Ed.] We are going to design a kind of receiver that is not expensive, but is easy to be made and to be used by the beginner.

Since 1982, 17 amateur stations have been set up in China (P.R.C.). They are distributed mainly in Peking, Shanghai, and FuZou regions. (See Table 1.) They are permitted to operate on all amateur bands. Usually they are worked in CW and SSB. The Shanghai station also works SSTV, ATV, and OSCAR satellite.

Now there are some hundreds of amateurs joining in the activity—secondary school students and elementary school students; others are teachers, workers, army men, students in university, and so on. Great advances have been made in amateur radio of China, and more and more stations will be set up as amateurs apply their minds and learning to the work.

I hope to make more new friends in 1987 and exchange experiences with others.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
85 530, Negev MPO
Israel

The Annual Israel Amateur Radio Club social evening (last December) in Tel Aviv was the biggest yet, with 650 attending. Doubtlessly more than partly responsible was a raffle that radio clubs the world over could be proud of. For two months, members of a small dedicated group of hams had been making pests of themselves going around to ham-involved businesses and others, and made sure that word leaked out about their successes. Nearly 200 prizes were raffled off: station accessories, computing gear, textiles, artifacts, electronic equipment, a year's towing service, and the grand prize, a round-trip to London with two weeks accommodation! Ticket sales for the drawings were overwhelming, and the IARC treasury became richer by a few thousand shekels—which will guarantee better IARC membership services in 1987.

There were exhibitor's stands in the lobby of the Bessarabia House showing the latest gear, and a demonstration of three packet stations. This was a hit, showing how messages were moved at the lightning speed of 1200 baud, and how the station in the middle set itself up as a digipeater, relaying messages, untouched by human hands.

Packet in Israel. This exciting new mode is catching on by leaps and bounds, and is so hard to keep track of that by the time you read this it doubtless will be out of date. We are still in the infancy stage, but an explosion is just around the corner. As of now (January) there are 20 stations equipped with packet and at least twice that number contemplated for the immediate future. Although masses of amateurs here still think of packet as just a glorified form of RTTY, it's only a matter of time before they see what this actually is, get envious of their friends, and make the small extra investment necessary.

Look for Israeli stations between 14.105 and 14.108. 4Z4ZB in Jerusalem leaves his TNC on 14.1075 MHz all day Friday so he can be contacted or used as a relay, and the rest of the week it's on VHF, serving as a digipeater on 144.675 MHz, the Region One IARU Packet Channel. 4X6OJ is active with bulletin board on HF, and is working on an input/output that will be linked to VHF. The IARY has authorized two digipeaters, with other private stations already serving this purpose on 145.675 MHz. Country-wide hookup is already a reality, and soon, if conditions permit, you should be able to contact an Israeli packeteer on HF, be linked into local VHF, and make instant contact with any Israeli packet station. The possibilities are mind-boggling, and it doubtlessly will be amusing in a few years to look back and read what's written here today.

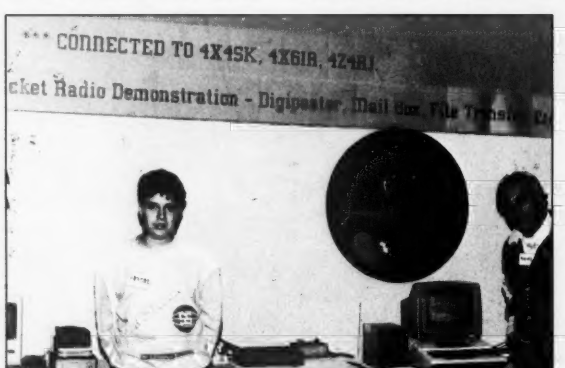
Easier Reciprocal License. I wrote earlier that you had to appear in person to get your reciprocal license when visiting here. Now you can save precious time by writing several months before you come to Ahron Kirschner 4X4AT, IARC, Box 4099, 61 040 Tel Aviv, Israel, and request the Ministry of Communications form to fill out. Return this completed form along with a photocopy of your license, callsign, and list of equipment you plan to bring, and the IARU will deal with the red tape and send you the reciprocal license (provided, of course, you are a national of a country Israel has a reciprocal agreement with, namely, Australia, Austria, Canada, Chile, Costa Rica, Holland, Luxembourg, Sweden, Switzerland, the UK, United States, Uruguay and West Germany).

Private Lines. In order to eliminate unwanted interference and occasional intermod, the Haifa repeater on 145.625 needs a 192.8-Hz subaudible tone tagged to your signal to access it. The Jerusalem repeater on 145.625 will have followed suit by the time you read this. This one tone will be universal for all of our repeaters. A Haifa amateur has devised a simple tone generator built around a DTMF chip and a 455-kHz miniature i-f crystal filter that is added easily to all rigs. So don't forget to have a PL generator on your 2-meter rig before you get here; and it also will be fun to bring some packet equipment. Then, if you have any room left in your suitcase, bring along some clothes!

Mailbox on Mt. Carmel. The W4FQM/4X RTTY repeater on Mt. Carmel, near Haifa, has recently received a new addition: a mailbox given by the donor of the repeater, Ed Webb W4FQM. The unit is an Info-Tech M-700A with 64K memory, 48 for the mailbox and 16 for bulletins, one of the most popular of which is 4X4FU's *DX Bulletin*, which he updates several times a week.

By accessing the machine and entering the right request, you can see printed out on the screen instructions on how to make full use of all of the repeater's facilities, and also how to link up the Haifa FM repeater on R0 with the Upper Galilee machine on R3.

At all times of the night and day you can hear the teletype tones when your rig's scanner stops at 145.300 MHz. Just a year and a



Three packet stations demonstrating digipeater, mailbox, and file transfer operations at the annual IARC social evening: 4Z9CBD (left) and 4Z4RJ.

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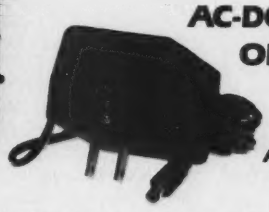

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The excellent sensitivity of the 1200H makes it ideal for use with the telescoping RF pick-up antenna; accurately and easily measure transmit frequencies from handheld, fixed, or mobile radios such as: Police, firefighters, Ham, taxi, car telephone, aircraft, marine, etc. May be used for counter surveillance, locating hidden "bug" transmitters. Use with grid dip oscillator when designing and tuning antennas. May be used with a probe for measuring clock frequencies in computers, various digital circuitry or oscillators. Can be built into transmitters, signal generators and other devices to accurately monitor frequency.

The size, price and performance of these new instruments make them indispensible for technicians, engineers, schools, Hams, CBers, electronic hobbyists, short wave listeners, law enforcement personnel and many others.

STOCK NO:

#1200HKC	Model 1200H in kit form, 1-1200 MHz counter complete including all parts, cabinet, Ni-Cad batteries, AC adapter-battery charger and instructions	**$ 99.95**
#1200HC	Model 1200H factory assembled 1-1200 MHz counter, tested and calibrated, complete including Ni-Cad batteries and AC adapter/battery charger	**$137.50**
#1300HC	Model 1300H factory assembled 1-1300 MHz counter, tested and calibrated, complete including Ni-Cad batteries and AC adapter/battery charger	**$150.00**

ACCESSORIES:

#TA-100S	Telescoping RF pick-up antenna with BNC connector	**$12.00**
#P-100	Probe, direct connection 50 ohm, BNC connector	**$18.00**
#CC-70	Carrying case, black vinyl with zipper opening. Will hold a counter and accessories	**$10.00**

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185

half ago when Ed sent the RTTY repeater over this way, you wouldn't have imagined that digital communications could catch on so fast. I, for one, couldn't imagine what you would need a RTTY repeater for on 2 meters, but now, with the addition of the mailbox and its manifold uses, I see how nearsighted I really was! Digital and space communications are no longer modes of the future; they are here and now.

Next time: 4Z4ZB's first Israel-to-space two-way amateur QSO, the resultant publicity, and the mail response to the IARC.

NEW ZEALAND

D.J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

NZART CONFERENCE IN MAY

If you are in New Zealand this month, the annual NZART Conference will be held over the weekend of May 30 to June 1 at Wanganui, on the west coast of North Island about 200 miles north of Wellington. If interested, contact the Conference Secretary, PO Box 7058, St. Johns, Wanganui.

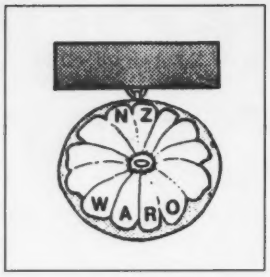

Fig. 1. The WARO badge.

WARO SILVER ANNIVERSARY

March marked the 25th anniversary of the NZ WARO, the Women's Amateur Radio Operators Club in New Zealand, which was formed at the 35th NZART conference in 1961 when Thelma Souper ZL2JO (now a Silent Key) suggested a ZL-YL club to a small group of YL operators.

The idea was met with enthusiasm, national YL nets were begun on July 11, 1961, and with the addition of separate nets for the North and South Islands and CW, they have continued each month to the present. As many ZL-YL operators as possible were contacted, and the inaugural meeting was held March 10, 1962, at Brents Hotel in Rotorua, with pledge of support received from those unable to be there in person. ZL1s present were Florence Voss AXP, Judith Holland AWM, Celia Reed ALK, Janette Barker ANA, Vicki Shaw OC, Enid Rosen, and, of course, ZL2JO.

WARO was honored to have amongst the foundation members a few YLs who, like ZL2JO, had been on the air since the early 30s. Notable was Myrtle Earland ZL4GR, New Zealand's first licensed YL operator (OZ3AG), now a Silent Key, who was a lady of renown and active in amateur radio for over 50 years, and the recipient of the first special WARO Award in 1980 "to the Grand YL of ZL Amateur Radio."

The WARO's objective is "to promote and encourage friendship and interest in radio amongst Women Radio Amateurs." This aim has been fulfilled, since the present day membership is composed of 121 ZL members, 37 associate members, and 60 DX members, for a total of 218. These figures mirror a steady gain that is still continuing, as well as worldwide recognition. The first overseas member was Mildred K9HRH, a Silent Key now since 1969.

In 1969, the WARO Award was introduced. The attractive certificate features "Pania of the Reef," with seals added for extra YL contacts after the basic award (see "Pania of the Reef Award" sidebar). Pania is a young Maori maiden in a legend. Lured by the siren voices of the Sea People, she swam out to meet them, and when she endeavored to return to her lover, she was transformed into the reef which lies beyond the breakwater at Napier and bears her name.

Besides the WARO Award, WARO organizes an annual 80-meter contest for the Thelma Souper Memorial Trophy, in April. This is open to OMs as well as YLs, with the former competing for certificates; the trophy goes to the WARO member with the highest score.

In 1981, WARO adopted a flower emblem and included it in a badge now worn by members (see Fig. 1). It is "the Mt. Cook lily"—which really is the giant mountain buttercup *(Ranunculus Lyallii)*. It grows up to three feet tall, with leaves that are bowl-shaped to hold rain or mountain dew, with flowers about 2-1/2" in diameter. It also has its own callsign, ZL2YL, used on special occasions, such as during the March Jubilee Award.

If you are interested in WARO or the awards, write the president, Jeanne Gilcrest ZL2BOD, 20 Vogel Street, Hawera, New Zealand, or the secretary, Anne McMaster ZL3VR, Greens Road, R.D.1, Kaiapoi, South Island, N.Z.■

PANIA OF THE REEF AWARD

All contacts, any mode, any band, except WARO Net contacts or contest contacts are eligible. QSLs not required; send certified list to Award Custodian, Vicki Shaw ZL1OC, PO Box 2088, Whakatane, N.Z., with sufficient IRCs for mailing you the certificate.

DX stations work six resident ZL WARO members from June 1, 1969, to date; VK and ZL work 12 resident members. Endorsement seals available for each six additional contacts (DX) or 12 contacts (VK, ZL), with contacts with overseas members of WARO eligible for counting towards seals AFTER having logged at least three ZL contacts, for each endorsement.

DX listeners must list 10 contacts heard with WARO members since January 1, 1979. List full log details with callsigns of both stations concerned. Endorsements for each additional five contacts. VK and ZL: 20 contacts for the basic award; additional 10s for endorsement seals.

If interested: ZL YLs may be found each month on International YL Day (the 6th of each month), on 14.288 either in QSO or calling CQ YL every hour on the hour. Propagation permitting, and with the recent slight improvement [written in February], signals should be able to be heard on occasion. The YLs also operate on 18 and 80 meters on these days.

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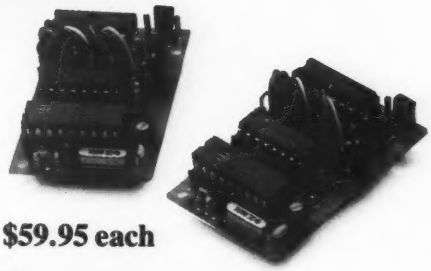

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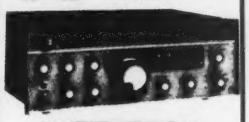

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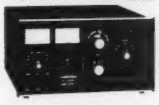

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For crank-up, self-supporting towers we recommend Hy-gain's series. The **HG-37SS, HG-52SS, HG-54HD, & HG-70HD** represent "top drawer" quality. **REBATES UNTIL 9/30/88!** Shipped freight prepaid!

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Electrically transparent guy systems in stock!

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NEW!

PHONE REMOTE

MODEL 5000A

OPERATE YOUR HOME BASE STATION EVEN WHEN YOU'RE NOT AT HOME

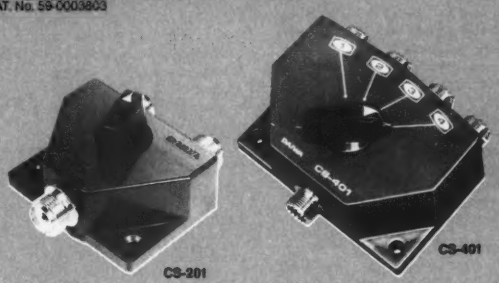
New Product NEVER BEFORE OFFERED!

PHONE REMOTE is an interface between your home base station and your home telephone line. It allows operation of your home base station from any touch tone telephone using the touch tone pad to control PUSH-TO-TALK. **PHONE REMOTE** works with any transceiver, HF, VHF or UHF. ACTIVITY and PUSH-TO-TALK timers are provided in case the telephone connection is lost. All operational features are switch programmable.

TRI-H COMMUNICATIONS CORP.
P.O. Box 4075
Winter Springs, FL 32708
Telephone (305) 295-8094

Coaxial Switches

PAT. No. 59-0003803



	CS-201 2 Position	CS-201G 2 Position	CS-401 4 Position	CS-401G 4 Position	CS-4 4 Position
Frequency:	500 MHz	1.3 GHz	500 MHz	500 MHz	1.5 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
Isolation:	+60 dB	+60 dB	+50 dB	+50 dB	+60 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	500 W PEP 250 W CW

Insertion Loss: All models less than 0.2 dB

DAIWA

DAIWA®
Electronics Corporation
1908A Del Amo Blvd. ▪ Torrance, CA 90501
(213) 212-6057 ▪ (213) 212-6058

Specifications subject to change without notice. ▪ All models and types not represented.

264

PERFORMANCE AND VALUE WITHOUT COMPROMISE

KRP-5000 REPEATER

NEW FOR 1987

Word is spreading fast- "Nothing matches the KRP-5000 for total performance and value. Not GE, not even Motorola."

RF performance really counts in tough repeater environments, so the KRP-5000 receiver gives you 7 helical resonators, 12-poles of IF filtering, and a precise Schmitt trigger squelch with automatic threshold switching. The transmitter gives you clean TMOS FET power.

Enjoy high performance operation with remote programmability, sequential tone paging, autopatch, reverse autopatch, 200-number autodial, remote squelch setting, status inputs, control outputs, and field-programmable Morse messages.

See us at Dayton Booths 106, 107 and 108

Call or write for the full performance story . . . and the super value price!

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TELEX: # 4932256 KENDECOM

KRP-5000 Repeater shown with PA-100 Amplifier

The first choice in
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Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

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Your company name and message can contain up to 25 words for as little as $199 yearly (prepaid), or $50 for three months (prepaid). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the August '87 issue must be in our hands by June 1st. Mail to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458. ATTN: Hope Currier.

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U. S. S. R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U. S. S. R.								20	20			

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U. S. S. R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

Between April 29th and May 3rd expect an unsettled to active geomagnetic field and poor ionospheric propagation. Be alert for extremes of weather and geologic upsets such as volcanic eruptions and earthquakes on May 1, 14, and 30. Please note that expected conditions may vary from predicted dates by as much as two days in either direction; most likely earlier rather than later.

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 P	2 P
3 P	4 P–F	5 F	6 F–G	7 F–G	8 G–F	9 F
10 F–P	11 P	12 P	13 P	14 P	15 P	16 P
17 P	18 P–F	19 F	20 F–G	21 G	22 G	23 G–F
24 F–P 31 P	25 P	26 F–P	27 F–P	28 P	29 P	30 P

KENWOOD

pacesetter in Amateur radio

ALL NEW FM mobile!

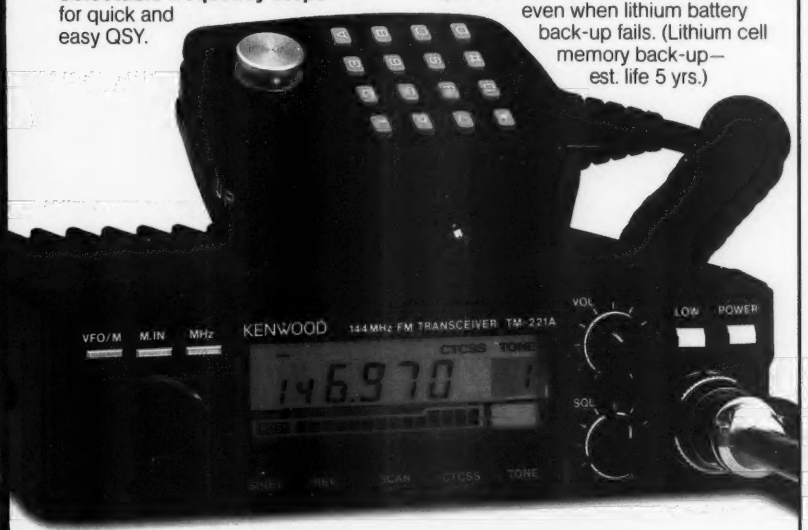
Here's One for You!

TM-221A/421A

2 m and 70 cm FM compact mobile transceivers

The all-new TM-221A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!

- **TM-221A provides 45 W. TM-421A is the first 35 W 70 cm mobile!** Both models have adjustable 5 W low power.
- **Selectable frequency steps** for quick and easy QSY.
- **TM-221A receives from 138-173.995 MHz. This includes the weather channels!** Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.)
- **The TM-421A covers 438-449.995 MHz.** *(Specifications guaranteed for Amateur band use only.)*
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**—makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Packet radio compatible!**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up—est. life 5 yrs.)
- **14 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Programmable band scanning.**
- **Memory scan with memory channel lock-out.**
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **New amber LCD display.**
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**



RC-10 Remote Controller

Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to **either or both** TM-221A and TM-421A with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)

Optional Accessories:

• **RC-10** Multi-function handset remote controller • **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation • **PS-50/PS-430** DC power supplies • **TSU-5** Programmable CTCSS decoder • **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz) • **SW-100B** Compact SWR/power/volt meter (140-450 MHz) • **SW-200A** SWR/power meter (1.8-150 MHz) • **SW-200B** SWR/power meter (140-450 MHz) • **SWT-1** Compact 2 m antenna tuner (200 W PEP) • **SWT-2** Compact 70 cm antenna tuner (200 W PEP) • **SP-40** Compact mobile speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer • **MA-4000** Dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mobile mount

Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

MISSOURI RADIO CENTER

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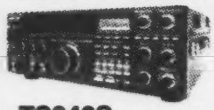

TS940S "DX-cellence"

- Programmable Scanning
- High Stability, Dual Digital VFO's
- 40 Channel Memory
- General Coverage Receiver

KENWOOD

TS440S "DX-CITING"

- 100% Duty Cycle
- 100 memories
- Direct Keyboard Entry
- Optional Built-in AT

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TM-3530A
220 MHZ MOBILE FM TRANSCEIVER

- 220-225 MHz with 25 Watts
- 7-Digit Telephone No. Memory
- Direct Frequency Entry
- 23-Channel Memory

KENWOOD

NEW

TH-215A
"FULL FEATURED 2m HT"

- 141-163 MHz Receive
- 144-148 MHz Transmit
- 2.5w Output (5w Optional)
- 10 Memories
- Built-in CTCSS Encoder
- Nine Types of Scanning

YAESU

FT-757GX "CAT SYSTEM"

- All Mode Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

CALL FOR BEST PRICE!

YAESU

FT-767GX HF/VHF/UHF BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

YAESU

FT23/73R

- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 600 MAh Standard Opt. 5w

New "super handie"

YAESU

FT-109RH
220 MHz H.T.

- 5 Watts Output
- Battery Saver
- 10 Memories
- Multiple Scanning Routines
- Power Meter

ICOM

IC-735 "NEW"

Can you put a price tag on reliability? Now ICOM offers a ONE YEAR WARRANTY on its HF Transceivers & Receivers purchased after August 1, 1986.

ICOM

IC-751A "NEW"

- 100 KHz - 30 MHz
- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

ICOM

IC-38A

- Full 25W, 5W low
- 21 memories
- Subtones built in

RX 215-230 MHz
CALL FOR BEST PRICE

ICOM

IC-μ2AT

- 140-163 MHz
- 10 Memories
- 1W, 1.5W optional
- 32 tones built-in

IC-03AT

- 220 to 224.995 MHz
- 2.5W, 5W Optional
- Built in subtone
- 10 Memories

Kantronics

KAM

Kantronics All Mode

- CW, RTTY, ASCII, AMTOR, HF & VHF Packet
- RS-232/TTL, Universal Compatability
- Transmit and Receive CW 6-99 wpm, RTTY/ASCII 45-300 Baud, ARQ, FEC, SELFEC, Listen ARQ, VHF and HF Packet

MFJ

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TNC 2 PACKET RADIO

- VHF and HF Packet
- Precision Tuning Indicator
- AX .25 Level 2 Version 2 Software
- TTL Serial Port
- More!

ASTRON CORPORATION

Power Supply

• RS7A	$48
• RS12A	$68
• RS20A	$88
• RS20M	$105
• VS20M	$125
• RS35A	$133
• RS35M	$149
• VS35M	$165
• RS50A	$189
• RS50M	$215
• RM50A	$219
• VS50M	$229

NOVICES

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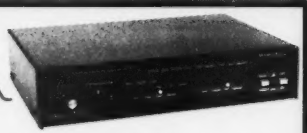
AEA



PK 232

- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.

HUSTLER | HYGAIN | ICOM | • MOST ORDERS SHIPPED SAME DAY • | J.I.L. | KANTRONICS | KDK

HF performance you can have a real field day with.

With Yaesu's FT-757GX/II, you can enjoy full-featured HF performance just about anywhere.

On vacation. During field day. On the road. Or in your shack.

Because the FT-757GX/II packs all its HF performance into one highly compact, action-ready case. A case so small, it even fits under airplane seats.

Of course, you've probably noticed a similarity to its predecessor, the FT-757GX. That's purely intentional. And now its performance is even better.

With new features like memory storage of operating mode. Slow/fast tuning selection. Automatic step-change according to mode. IF notch filter. 10 memories. And VFO to VFO scan.

Plus you get an iambic electronic keyer. Woodpecker noise blanker. 600-Hz CW filter. AM and FM modes. AF speech processor. And 25-kHz marker generator. All at no extra charge.

Three microprocessors. Dual VFOs. Single-button VFO/memory swap. Receive coverage from 500 kHz to 30 MHz. Transmit coverage from 10 to 160 meters, including WARC bands. All-mode coverage (LSB, USB, CW, AM and FM). 100-watt RF output.

QSK operation. Massive heatsink and duct-flow cooling system for continuous RTTY operation for up to 30 minutes.

Computer Aided Transceiver (CAT) System for computer control via optional interface (software is available from your Yaesu dealer).

Of course, the FT-757GX/II offers the kinds of options you'd expect from Yaesu, too. Including standard and heavy-duty power supplies, automatic antenna tuner, and more.

So no matter where you work the DX, take along Yaesu's FT-757GX/II. The full-featured HF rig you'll have a real field day with.

YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100.

165

Prices and specifications subject to change without notice.

KENWOOD

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First Again!

TW-4100A

2 m/70 cm FM Dual Bander

A Kenwood original just got better! Kenwood was the first to develop a 2 m/70 cm mobile radio in a single, compact package. Since then, other companies have imitated the concept, but still have not done it the "Kenwood way." The all-new TW-4100A is more compact, more powerful , and packed with more features than ever before! With many new features and accessories, and backed by Kenwood's experience, the all-new Kenwood Dual Bander is light years ahead of the rest!

- **Selectable full duplex cross band ("telephone style") operation.** Remote base or cross band repeater function possible (a control operator is needed for remote or repeater operation*).
- **45 watts on 2 m. 35 watts on 70 cm.** 5 watts (adjustable) low.
- **Frequency coverage: 142-149 MHz (allows operation on certain MARS and CAP frequencies) and 440-449.995 MHz.**

- **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!
- **Proven high performance Kenwood GaAs FET front end receiver.**
- **Easy to operate!** Only 3 knobs and 8 keys on the front panel.
- **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability and performance!
- **10 memory channels.** Lithium battery backs up memory. Store frequency, offset, subtone. Two channels store the transmit and receive frequencies independently **for odd split or cross band operation.**
- **Front panel-selectable CTCSS tone (when optional TU-7 is installed.)**

- **Non-volatile operating system.** Even after memory back up cell dies, all operating features remain intact! No re-programming or "board-swapping" necessary!
- **Programmable band scan and memory scan with memory channel lock-out.**
- **Large, illuminated LCD display and main knob.** For excellent visibility in direct sunlight or darkness.
- **Selectable frequency step for quick and easy QSY.**
- **Voice synthesizer VS-2 option.**

Optional accessories:

• **PS-50/PS-430** DC power supplies • **MU-1** DCL modem unit • **TU-7** CTCSS encoder • **VS-2** Voice synthesizer • **SW- 100B** SWR/Power/Volt meter 140-450 MHz for mobile use • **SW-200B** SWR/Power meter for base station use 140-450 MHz. 0-200 W in 2 ranges • **SWT-1/SWT-2** 2 m and 70 cm antenna tuner • **SP-40** Compact speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile microphone • **MA- 4000** Dual band mobile antenna with duplexer (mount not included) • **MB-11** Extra mobile mount

- **Digital Channel Link (DCL) option.**

KENWOOD

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Compton, California 90220

*Please check FCC regulations on repeater operation.
Minor modification necessary for repeater operation.
Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.